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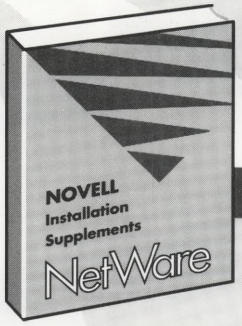
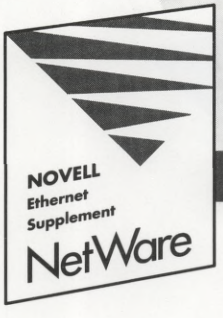


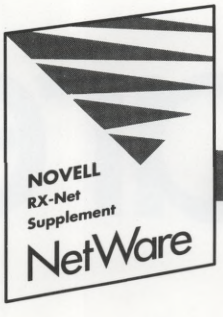
INSTALLATION SUPPLEMENTS

- Installation instructions for the following networking hardware:
  - Novell Ethernet
  - Novell RX-Net
  - IBM Token-Ring Network
  - IBM PC Network
  - 3COM EtherLink
- Specific network boards and cabling discussed in each supplement are listed below.



NOVELL ETHERNET

- NE1000 (Assy. #950-05441)
- NE1000 (Assy. #810-160-00x)
- NE2000 (Assy. #810-149-00x)
- NE/2
- NE2/32
- NE3200
- Thin Ethernet hardware and cabling
- Thick Ethernet hardware and cabling

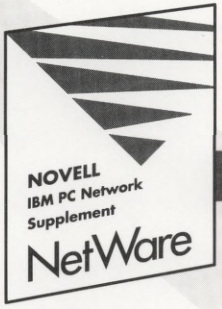


NOVELL RX-NET

- RX-Net II (SMC PC120)
- RX-Net/2 (SMC PS110)
- ARCnet hardware and cabling

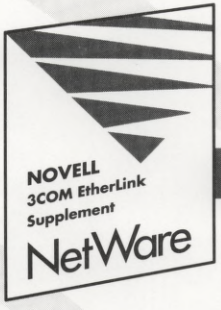
IBM TOKEN-RING NETWORK

- IBM Token-Ring PC Adapter
- IBM Token-Ring PC Adapter II
- IBM Token-Ring 16/4 Adapter
- IBM Token-Ring PC Adapter/A
- IBM Token-Ring 16/4 Adapter/A
- IBM Token-Ring 16/4 Busmaster Server Adapter/A
- Token-Ring hardware and cabling



IBM PC NETWORK

- IBM PC Network Adapter II
- IBM PC Network Adapter II/A
- IBM PC Network Baseband Adapter
- IBM PC Network Baseband Adapter/A
- Broadband hardware and cabling
- Baseband hardware and cabling



3COM ETHERLINK

- EtherLink 3C501 (Assy. #1221)
- EtherLink Plus 3C505 (Assy. #1194)
- EtherLink Plus 3C505 (Assy. #2012)
- EtherLink II 3C503 (Assy. #2227)
- EtherLink II TP 3C503 (Assy. #6330)
- EtherLink/MC 3C523 (Assy. #4233)
- EtherLink/MC TP 3C523 (Assy. #6852)
- Thin Ethernet hardware and cabling
- Thick Ethernet hardware and cabling
- Twisted-pair Ethernet hardware and cabling

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How to use this manual

This manual explains how to install Novell Ethernet networking hardware on a NetWare network. It is a supplement to several main NetWare manuals.

If you haven't already done so, read and follow the instructions in your main NetWare manual up to the point where it advises you to consult this supplement.

Manual organization

This manual contains four sections and two appendixes.

Section 1: Planning the network

This section contains a review of two types of Ethernet network cabling, their associated network hardware, and guidelines for using each cabling type or combining them. It also explains how to plan your own network and how to prepare and install the networking hardware.

Section 2: Setting and installing Novell Ethernet boards

This section contains instructions for configuring and installing the following Novell Ethernet boards for International Standard Architecture (ISA) and microchannel architecture (MCA) machines:

- NE1000 (Assy. #950-05441)
- NE1000 (Assy. #810-160-00*x*)
- NE2000 (Assy. #810-149-00*x*)
- NE/2

Section 3: Installing and setting NE/2-32 boards

This section contains instructions for installing and configuring the 32-bit NE/2-32 board in microchannel workstations and NetWare v3.*x* file servers.

Section 4: Cabling the network

This section contains instructions for cabling thin-Ethernet networks, thick-Ethernet networks, and combination thin/thick networks.

Appendix A: File server board settings for NetWare v3.*x*

This appendix contains instructions for configuring the boards listed in Section 1 for NetWare v3.*x* file servers.

Appendix B: Installing and configuring the NE3200 file server board

This appendix contains instructions for installing the 32-bit NE3200 board in Extended Industry Standard Architecture (EISA) file servers running NetWare v3.*x*.

Note: For information on loading LAN drivers for NetWare v3.*x* file server drivers, see "Load LAN Driver" in the *NetWare v3.11 System Administration* manual.

For information on linking LAN drivers for NetWare v2.*x* file servers, see the "Linking and Configuring Module" in the Installation section of *Installing and Maintaining the Network*.

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Section 1: Planning the network

In this section, you will

- Learn common Ethernet network terminology.
- Learn the hardware and cable requirements for three types of Ethernet networks: thin-cable, thick-cable, and combination thin/thick-cable networks.
- Design your own network layout and make sure that you have all the hardware necessary to set up your own network.

Common Ethernet network terminology

An Ethernet network cables several network stations together so that they can communicate. (Network stations can be file servers, bridges, or workstations.) The network stations are connected at intervals to one long main cable, referred to as the trunk segment cable. The network stations and the main cable together form a trunk segment. (See Figure 1.1.)

The thin-Ethernet trunk segment cable is usually made up of a series of cable lengths connected with connectors, rather than one continuous cable.

The trunk segment is limited to a maximum length and a maximum number of stations it can accommodate. However, a network can be expanded beyond one trunk segment by linking two or more trunk segments together with a repeater. (See Figure 1.2.) A repeater forms a passageway for network signals traveling from one trunk segment to another; it also strengthens network signals.

The network trunk cable is the sum of all the trunk segment cables. Just as a trunk segment cable is the backbone of a trunk segment, the network trunk cable is the backbone of the whole network.

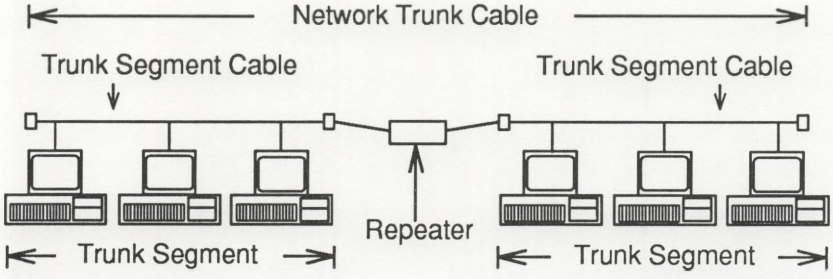


Figure 1.1
Parts of an Ethernet network

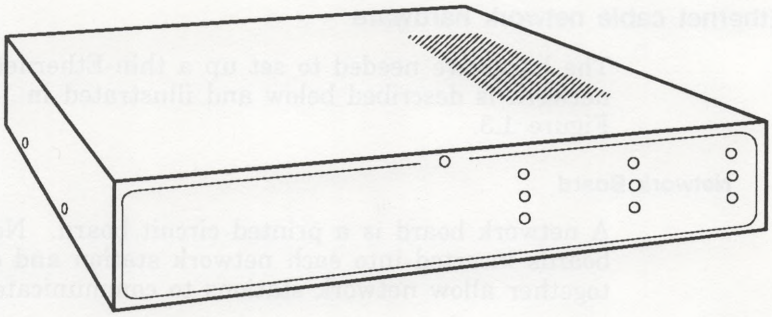


Figure 1.2
A repeater

There are two kinds of Ethernet cables. The first is called thin-Ethernet cable or thin cable. It is less expensive than the second, which is called thick-Ethernet cable, thick cable, or standard Ethernet cable.

These two kinds of Ethernet cable build three kinds of Ethernet network: thin-cable network, thick-cable network, and combination thin/thick-cable network.

The chart below shows where each type of network is discussed.

Type	Page
■ Thin cable	4
■ Thick cable	8
■ Thin/Thick cable	14

Thin-Ethernet cable networks

Thin-Ethernet cable network hardware

The hardware needed to set up a thin-Ethernet cable network is described below and illustrated in Figure 1.3.

Network Board

A network board is a printed circuit board. Network boards inserted into each network station and cabled together allow network stations to communicate.

BNC Connectors

BNC connector jacks and plugs connect network hardware. The BNC connector jack on a network board connects the board to the trunk segment cable. The BNC connector plugs, attached to both ends of thin-Ethernet cable lengths, connect the cable to T-connectors, barrel connectors, and other hardware.

Thin-Ethernet Cable

Thin-Ethernet cable is 0.2-inch RG-58A/U 50-ohm coaxial cable. It is available from Novell in pre-cut lengths of 20 feet, with a standard BNC connector plug attached to each end. Thin-Ethernet cable is also available from other industry suppliers in bulk quantities; however, bulk cable does not come with connectors attached.

BNC Barrel Connectors

BNC barrel connectors join two lengths of thin-Ethernet cable.

BNC T-Connectors

The two opposing jacks of the T-connector act as a barrel connector and join two lengths of thin-Ethernet cable. The remaining plug attaches to the BNC connector jack on a network board installed in a network station.

BNC Terminator

A BNC 50-ohm terminator "terminates" the network and blocks electrical interference on the network. It is attached to one of the two jacks on a T-connector when no other length of cable will be attached to that jack. Some BNC terminators also ground the network; these come with a grounding wire attached. You must use BNC terminators (one end with grounding wire and one end without grounding wire) to properly install an Ethernet network.

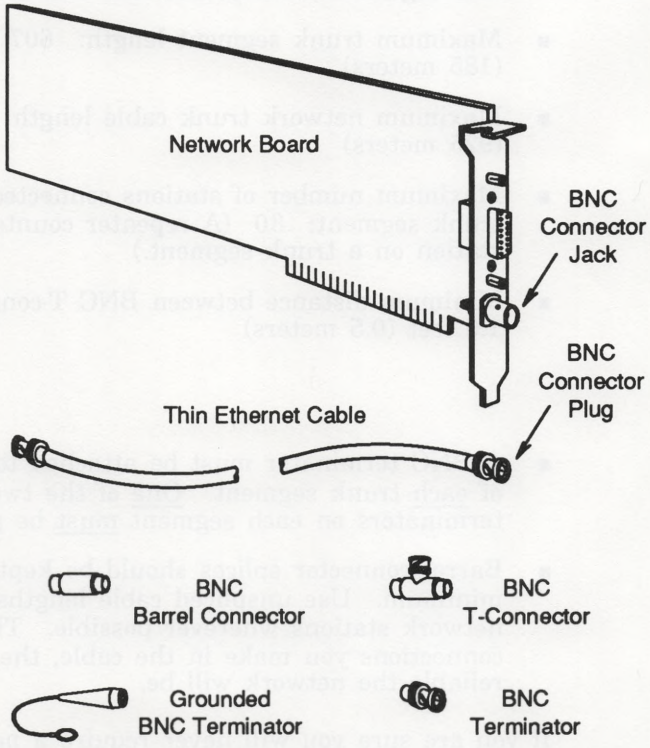


Figure 1.3
Thin-Ethernet cable network hardware

Thin-Ethernet cable network layout

Below is a summary of the limitations and rules pertaining to a thin-Ethernet cable network. Figure 1.4 illustrates this summary.

Limitations

- Maximum number of trunk segments: 5 (3 coaxial segments with network stations and 2 link segments without network stations)
- Maximum trunk segment length: 607 feet (185 meters)
- Maximum network trunk cable length: 3,035 feet (925 meters)
- Maximum number of stations connected to one trunk segment: 30 (A repeater counts as one station on a trunk segment.)
- Minimum distance between BNC T-connectors: 1.6 feet (0.5 meters)

Rules

- A BNC terminator must be attached to each end of each trunk segment. One of the two terminators on each segment must be grounded.
- Barrel connector splices should be kept to a minimum. Use unspliced cable lengths between network stations wherever possible. The fewer connections you make in the cable, the more reliable the network will be.

If you are sure you will never require a network trunk cable over 3,035 feet (925 meters) long, you may want to use thin-Ethernet cable, because this type of cable is less expensive and easier to install than thick-Ethernet cable.

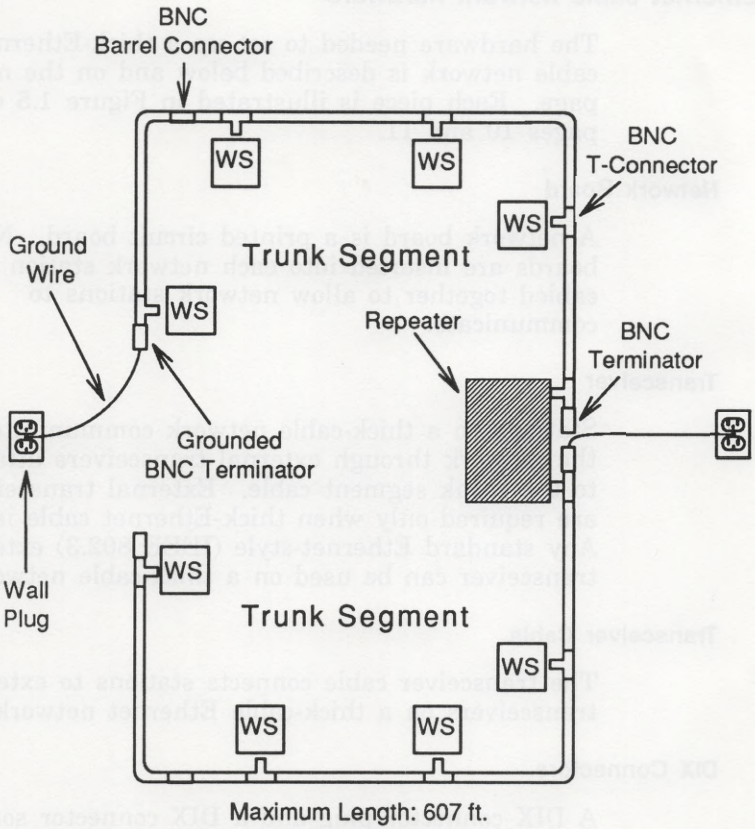


Figure 1.4
Example of a thin-Ethernet cable network

Thick-Ethernet cable networks

Thick-Ethernet cable network hardware

The hardware needed to set up a thick-Ethernet cable network is described below and on the next page. Each piece is illustrated in Figure 1.5 on pages 10 and 11.

Network Board

A network board is a printed circuit board. Network boards are inserted into each network station and cabled together to allow network stations to communicate.

Transceiver

Stations on a thick-cable network communicate with the network through external transceivers attached to the trunk segment cable. External transceivers are required only when thick-Ethernet cable is used. Any standard Ethernet-style (IEEE 802.3) external transceiver can be used on a thick-cable network.

Transceiver Cable

The transceiver cable connects stations to external transceivers on a thick-cable Ethernet network.

DIX Connectors

A DIX connector plug and a DIX connector socket are attached to either end of the transceiver cable. The DIX connector plug (characterized by several small pins) connects to a network board that has been installed in a network station. The DIX connector socket connects to an external transceiver.

Slide Lock

A slide lock firmly secures the connection between a transceiver cable and a network board installed in a station.

Thick-Ethernet Cable

Thick-Ethernet cable is 0.4-inch diameter 50-ohm coaxial cable and is available in various pre-cut lengths with a standard 0.4-inch diameter N-series connector plug attached to each end; it can be purchased from an authorized NetWare dealer. Thick-Ethernet cable is also available in bulk quantities. However, bulk cable does not come with connectors attached.

N-Series Connector Plugs

An N-series connector plug is installed on each end of a thick-Ethernet cable length.

N-Series Barrel Connectors

N-series barrel connectors join two lengths of thick-Ethernet cable.

N-Series Terminators

An N-series 50-ohm terminator "terminates" the network and blocks electrical interference on the network. It is attached to an N-series male connector on one end of a thick-Ethernet cable length. Some N-series terminators also ground the network; these come with a grounding wire attached. You must use an N-series terminator at each end of the cable; however, only one end of the cable must be earth grounded.

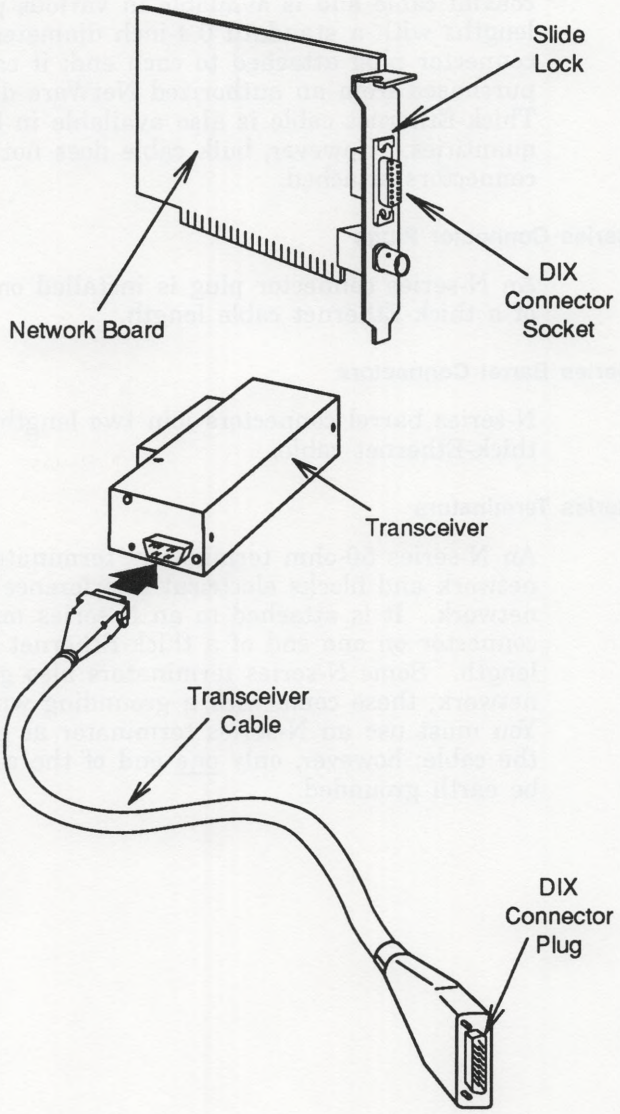


Figure 1.5
Thick-Ethernet cable network hardware

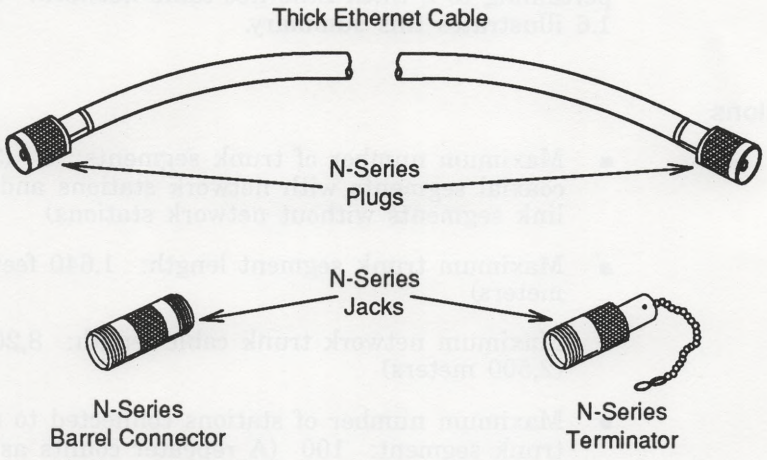


Figure 1.5 (*Continued*)
Thick-Ethernet cable network hardware

Thick-Ethernet cable network layout

Below is a summary of the limitations and rules pertaining to a thick-Ethernet cable network. Figure 1.6 illustrates this summary.

Limitations

- Maximum number of trunk segments: 5 (3 coaxial segments with network stations and 2 link segments without network stations)
- Maximum trunk segment length: 1,640 feet (500 meters)
- Maximum network trunk cable length: 8,200 feet (2,500 meters)
- Maximum number of stations connected to one trunk segment: 100 (A repeater counts as one station on a trunk segment.)
- Minimum distance between transceivers: 8 feet (2.5 meters)
- Maximum transceiver cable length: 165 feet (50 meters)

Rules

- A terminator must be attached to each end of each trunk segment. One of the two terminators on each segment must be grounded.
- Barrel connector splices should be kept to a minimum. Use unspliced cable lengths between network stations wherever possible. The fewer connections you make in the cable, the more reliable the network will be.

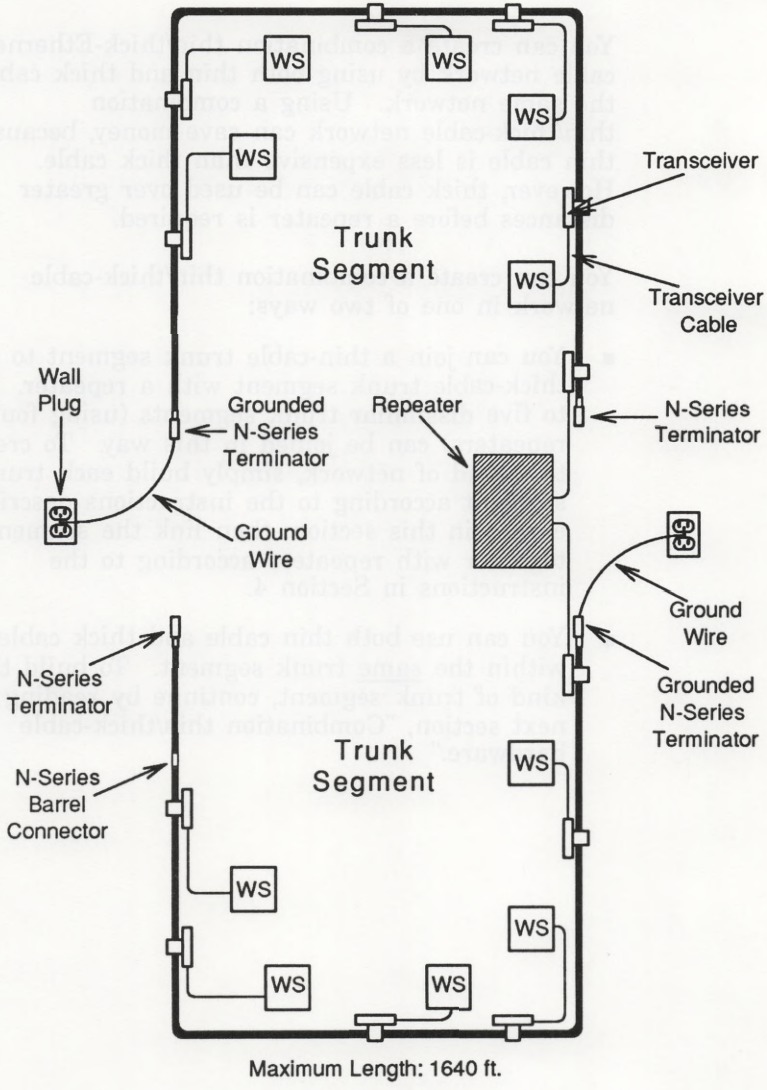


Figure 1.6
Example of a thick-Ethernet cable network

Combination thin/thick-cable networks

You can create a combination thin/thick-Ethernet cable network by using both thin and thick cable on the same network. Using a combination thin/thick-cable network can save money, because thin cable is less expensive than thick cable. However, thick cable can be used over greater distances before a repeater is required.

You can create a combination thin/thick-cable network in one of two ways:

- You can join a thin-cable trunk segment to a thick-cable trunk segment with a repeater. Up to five dissimilar trunk segments (using four repeaters) can be joined in this way. To create this kind of network, simply build each trunk segment according to the instructions described earlier in this section; then link the segments together with repeaters according to the instructions in Section 4.
- You can use both thin cable and thick cable within the same trunk segment. To build this kind of trunk segment, continue by reading the next section, "Combination thin/thick-cable hardware."

Combination thin/thick-cable hardware

Thin/thick-cable networks use the same networking hardware as thin-cable and thick-cable networks (described beginning on page 4). In addition, however, you need to use adapters to create the combination trunk segments. Two kinds of adapters are shown in Figure 1.7:

- N-series jack to BNC jack
- N-series plug to BNC jack

N-Series Jack to BNC Jack

N-Series Plug to BNC Jack

Figure 1.7
Adapters used in combination trunk segments

Combination thin/thick-cable network layout

This section describes how to combine thin cable and thick cable within a single trunk segment, using as much thin cable as possible. (Refer to Figure 1.8 for an example of a combination thin/thick-Ethernet cable network layout.)

Combination thin/thick-cable trunk segments are between 607 feet and 1,640 feet long. The minimum length is 607 feet because trunk segments shorter than 607 feet can be built with thin cable exclusively. And, as with all trunk segments, the maximum length is 1,640 feet.

To find the maximum amount of thin cable you can use in one combination trunk segment, use the following equation:

$$\frac{1{,}640 \text{ feet} - L}{3.28} = t$$

(L = length of the trunk segment you want to build; t = the maximum length of thin cable you can use)

For example, if you want to build a trunk segment that is 1,500 feet long and you want to minimize the cost of hardware, use the following equation to determine the maximum length of thin cable you can use:

$$\frac{1{,}640 \text{ feet} - 1{,}500 \text{ feet}}{3.28} = 43 \text{ feet}$$

You could use up to 43 feet of the less expensive thin cable. You would then use thick cable for the remaining 1,457 feet of cable required in the trunk segment.

Note: The maximum number of trunk segments that can be connected together is five.

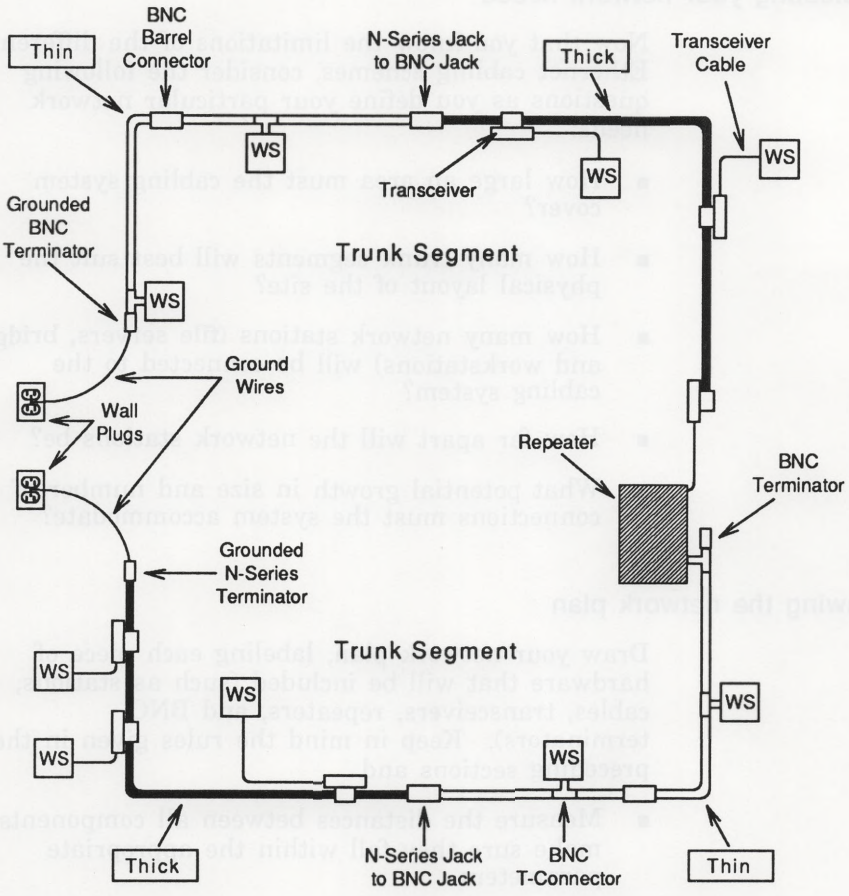


Figure 1.8
Example of a combination thin/thick-cable network layout

Planning the network layout

Evaluating your network needs

Now that you know the limitations of the different Ethernet cabling schemes, consider the following questions as you define your particular network needs:

- How large an area must the cabling system cover?
- How many trunk segments will best suit the physical layout of the site?
- How many network stations (file servers, bridges, and workstations) will be connected to the cabling system?
- How far apart will the network stations be?
- What potential growth in size and number of connections must the system accommodate?

Drawing the network plan

Draw your network plan, labeling each piece of hardware that will be included (such as stations, cables, transceivers, repeaters, and BNC terminators). Keep in mind the rules given in the preceding sections and

- Measure the distances between all components to make sure they fall within the appropriate parameters.
- Ensure that the locations you choose for file servers have adequate room for any peripherals (such as printers or external disk drives) that will be attached.

Summary

In this section, you

- Identified Ethernet network hardware.
- Examined thin-cable, thick-cable, and combination thin/thick-cable networks.
- Designed and sketched your own network.

The next section describes how to configure the network boards and install them in network stations.

Notes

Section 2: Setting and installing Novell Ethernet boards

This section explains how to set Novell Ethernet boards for NetWare networks. The boards listed below can be used in workstations, file servers, and bridges (routers) on any size network. They can be used with thin cable, thick cable, or a combination of the two.

This section includes settings for the following boards:

Board	Page
■ NE1000 (Assy. #950-054401) boards	25
■ NE1000 (Assy. #810-160-00*x*) boards	32
■ NE2000 (Assy. #810-149-00*x*) boards	41
■ NE/2 boards	54

This section also includes instructions for inserting Novell Ethernet boards into Industry Standard Architecture (ISA) and microchannel architecture systems.

You can use the NE1000 board in 8-bit expansion slots and the NE2000 board in 16-bit expansion slots for ISA machines. The NE/2 board is for microchannel file servers and workstations.

Note: If you will be using any of the boards in this section in files servers running NetWare v3.*x*, refer to Appendix A for file server board settings.

Labeling network boards

Refer to the sketch of the network layout you made in Section 1 and to your planning worksheets for the appropriate network station—workstations, bridge (router), or NetWare 286 file server. (The worksheets are in the main NetWare installation manual or in the bridges supplement.)

Then, using a string tag, an adhesive label, or some other form of identification, label each board with the following information:

- **The type of network station** into which the board will be inserted: workstation, file server, or bridge.
- **The specific network station** into which the board will be inserted. Identify the station by its intended physical location or user.
- **The configuration option** (the interrupt line, the base I/O address, and the base memory address) you plan to use for the board. (See page 21 to locate the configuration option table for a particular board.)

  Numbered configuration options are sets of supported values for each board's parameters. The option you select for setting the board is also used when you configure the LAN drivers in the workstation shell files, the bridge software, and the server operating system.

  Use default settings where possible (option 0). If you install two network boards in the same station, each board must have a unique setting. Avoid hardware conflicts by making sure a chosen setting is not also in use by some other device in the machine.

  Tip: When you use the same type network board in many workstations, you can simplify creating workstation shell files and boot diskettes if you use the same configuration option for each of these network boards (as long as none of the stations has conflicting settings on other boards).

Note: When you generate a NetWare shell and IPX for workstations containing NE/2 boards, no prompt asks you to select a configuration option, because NetWare drivers for NE/2 boards are "auto-configuring."

Any given NE/2 shell can be used by a workstation regardless of the workstation's hardware configuration settings.

- **The connector type** for the type of cable (thin or thick) you are using. Each Novell Ethernet board has both a BNC connector and a DIX connector on the mounting bracket. The BNC connector is used with thin cable (Cheapernet); the DIX connector is used with thick cable. You must "inform" each board whether it will be connected to thick or thin cable by enabling either the BNC connector or the DIX connector. Write "DIX" (for thick cable) or "BNC" (for thin cable) on the label.
- **Remote Reset** (if you plan to enable Remote Reset on a workstation network board). The Remote Reset option allows network boards to boot from a network (file server) disk instead of a local drive. This feature can be used with NE1000, NE2000, and NE/2 network boards installed in workstations.

The settings and instructions for each board are explained in the following order:

- Default settings (where applicable)
- The configuration option, which includes interrupt line and base I/O address
- Connector type
- Remote Reset (where applicable), which includes Remote Reset EPROM and base memory address

Use the index on page 21 to locate the section that contains instructions for setting the Novell Ethernet board you plan to use. Follow the instructions to make the appropriate settings on the boards.

When you have set the network boards, use the instructions on page 52 to insert the boards into ISA network stations.

The section for setting options on the NE/2 board also includes instructions on page 56 for installing it in a microchannel station.

Setting options on NE1000 (Assy. #950-054401) boards

This section lists the default settings and explains how to make the following settings on NE1000 (Assy. #950-054401) boards:

- Configuration option
- Connector type
- Remote Reset

Default settings

The factory default settings for Novell NE1000 (Assy. #950-054401) boards are 300h, IRQ3, Remote Reset disabled, and thin-Ethernet connector enabled.

The configuration option

Set the configuration options on the NE1000 (Assy. #950-054401) boards by completing the following steps for each board:

1. Locate the components used to make configuration option settings by referring to Figure 2.1.
2. Identify the configuration option you should use by checking the tag you attached to the board.
3. Refer to Figure 2.2 to find the settings for the appropriate configuration option.
4. Set the interrupt line and the base I/O address according to Figure 2.2. (The appropriate jumper block settings are located to the right of the configuration option numbers in the table.) Do not set the DMA channel.

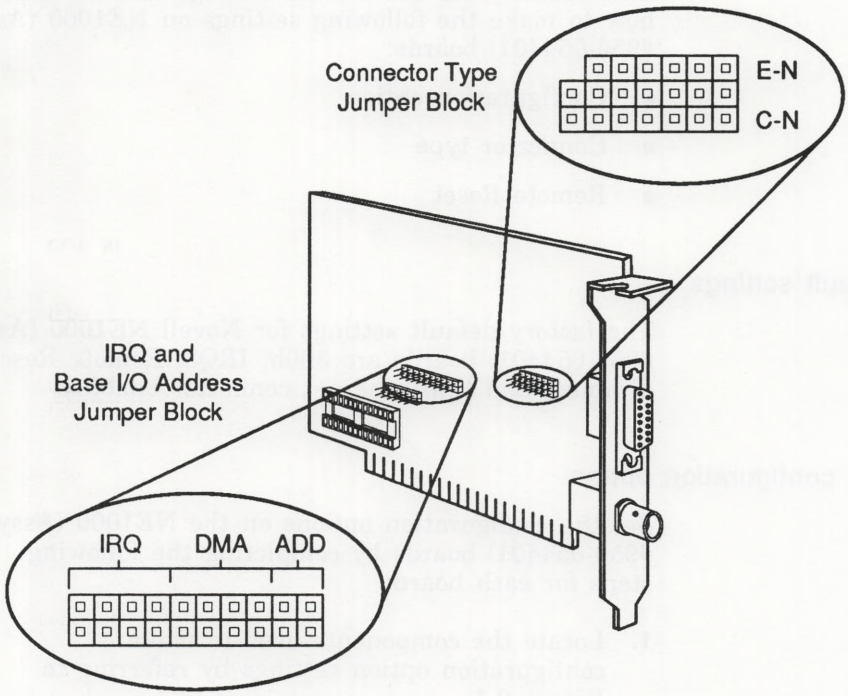
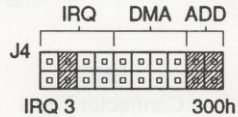
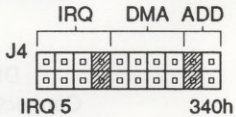
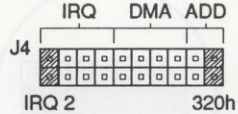
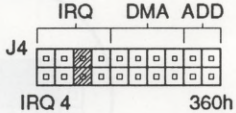
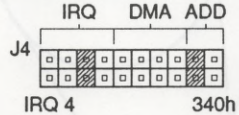
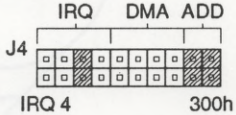
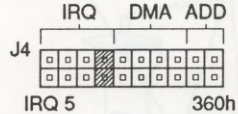
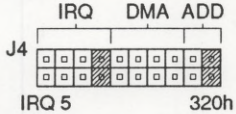
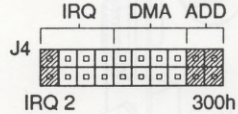
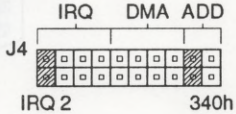
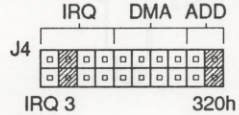
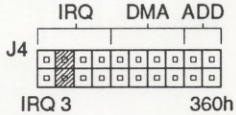


Figure 2.1
Location of NE1000 (Assy. #950-054401) board
configuration option components

Config. Option	Interrupt Line	Base I/O Address	Config. Option	Interrupt Line	Base I/O Address
0			* 6		
1			7		
2			8		
* 3			* 9		
4			10		
5			11		

* Not available in PC XT or equivalent when hard disk controller is present.

Figure 2.2
NE1000 (Assy. #950-054401) board configuration option table

Connector type

Refer to Figure 2.3 and note the jumper block used to make the connector type setting. Then, depending on the type of cable you are using, make the appropriate setting on each NE1000 (Assy. #950-054401) board as shown in Figure 2.3.

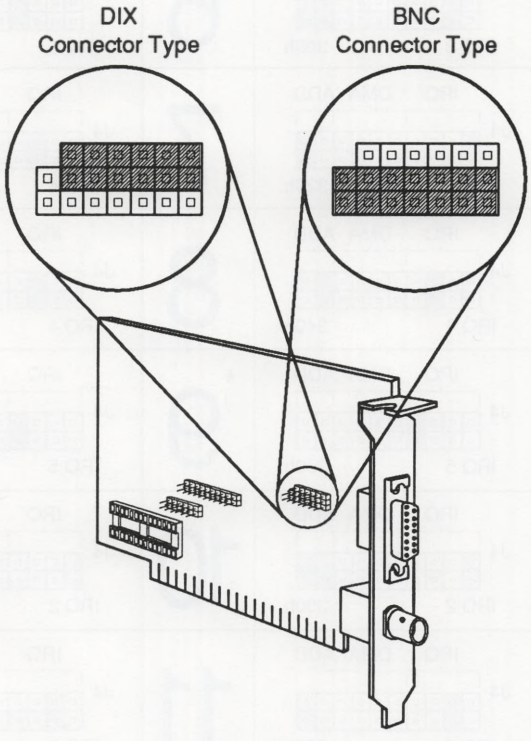


Figure 2.3
Connector type settings for
NE1000 (Assy. #950-054401) boards

Remote Reset

Remote Reset must be enabled on all NE1000 (Assy. #950-054401) boards that will use the Remote Reset feature. To install and enable Remote Reset on an NE1000 (Assy. #950-054401) board, refer to Figure 2.4 and complete the following steps:

1. Insert the Remote Reset EPROM by aligning the notch and the pins on the EPROM with the notch and the pin receptacles on the EPROM socket. Gently push the EPROM into the socket, being careful not to bend the pins.

2. Enable Remote Reset by placing a shorting plug on jumper block A of the base memory address jumper block.

3. Set the proper base memory address with jumper blocks B through F on the base memory address jumper block J7. Set the interrupt line and base I/O address with jumper block J4. Figure 2.5 on page 31 lists possible settings.

   - If you use an IBM PC AT or compatible as a workstation, you must use a base memory address between C800h and DE00h.
   - If you use an IBM PC XT (with a hard disk) or compatible as a workstation, you cannot use base memory address C800h or IRQ 5.

Note: Place unused shorting plugs on the jumper blocks, covering only one pin with each shorting plug.

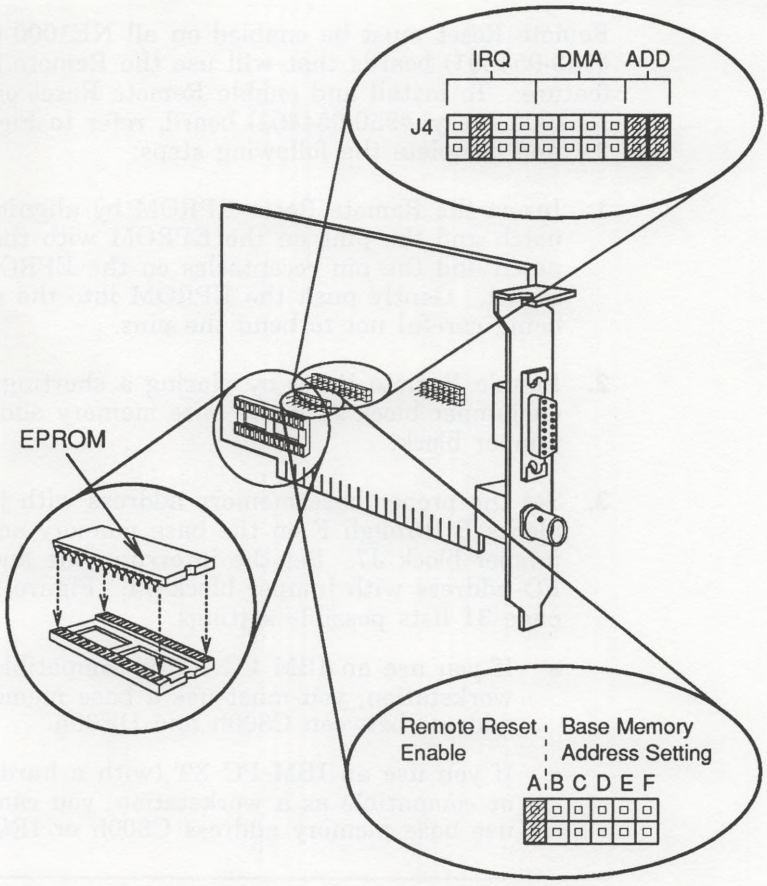
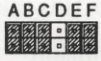
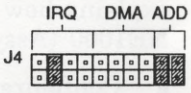
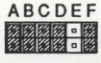
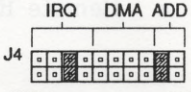
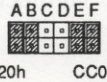
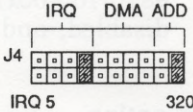


Figure 2.4
Installing a Remote Reset EPROM and enabling Remote Reset on an NE1000 (Assy. #950-054401) board

Config. Option	Base I/O Address	Base Memory Address	Interrupt Line	Base I/O Address
* 0		300h C800h		IRQ 3 300h
† 2		340h D000h		IRQ 4 340h
* 9		320h CC00h		IRQ 5 320h

* Not available in PC XT or equivalent when hard disk controller is present.

† ECONFIG Option

Figure 2.5
Configuration option settings for Remote Reset

If you are using standard Ethernet (802.3), choose configuration options 0 or 9.

If you configure NetWare for Ethernet II, choose configuration option 2. (If you run another operating system that uses a type code on your Ethernet cabling, you should use Ethernet II to avoid problems with packets.)

To insert an NE1000 (Assy. #950-054401) board into a network station, turn to "Inserting network boards into ISA network stations" on page 52.

Setting options on NE1000 (Assy. #810-160-00*x*) boards

The next section lists the default settings and explains how to make the following settings on NE1000 (Assy.#810-160-00*x*) network boards:

- Configuration option
- Connector type
- Remote Reset

Default settings

The factory default settings for Novell NE1000 (Assy. #810-160-00*x*) boards are 300h, IRQ3, Remote Reset disabled, and BNC connector enabled.

The configuration option

Set the configuration options for the NE1000 (Assy. #810-160-00*x*) boards by completing the following steps for each board:

1. Locate the components used to make configuration option settings by referring to Figure 2.6.
2. Identify the configuration option you should use by checking the tag you attached to the board.
3. Refer to Figure 2.7 (beginning on page 34) to find the appropriate configuration option. Configuration option 0 is the default setting.
4. Set the interrupt line and the base I/O address according to Figure 2.7. (The appropriate jumper block settings are located to the right of the configuration option numbers in the table.)

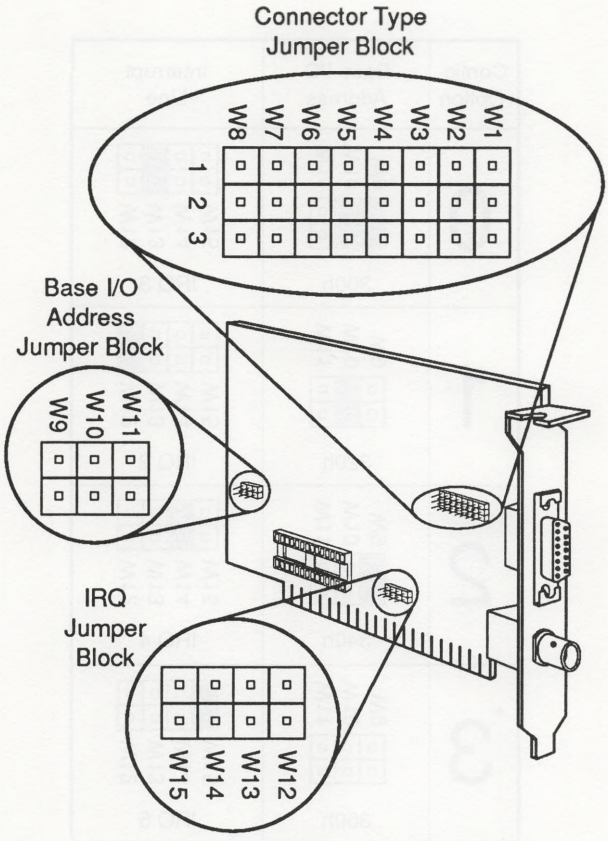
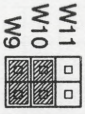
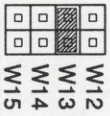
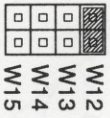
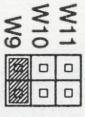
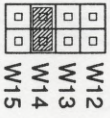
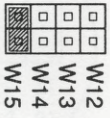
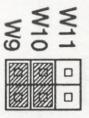
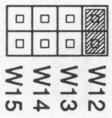
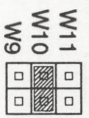
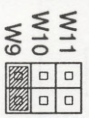
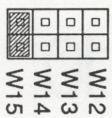
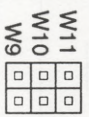


Figure 2.6
Location of NE1000 (Assy. #810-160-00*x*) board configuration option components

Config. Option	Base I/O Address	Interrupt Line
0	 300h	 IRQ 3
1	320h	 IRQ 2
2	 340h	 IRQ 4
* 3	360h	 IRQ 5

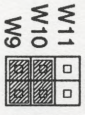
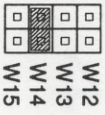
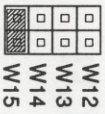
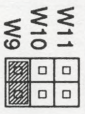
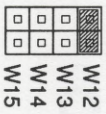
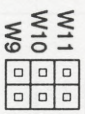
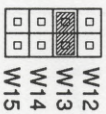
* Not available in PC XT or equivalent when hard disk controller is present.

Figure 2.7
NE1000 (Assy. #810-160-00*x*) board configuration option table

Config. Option	Base I/O Address	Interrupt Line
4	 300h	 IRQ 2
5	 320h	IRQ 3
* 6	 340h	 IRQ 5
7	 360h	IRQ 4

* Not available in PC XT or equivalent when hard disk controller is present.

Figure 2.7 (*Continued*)
NE1000 (Assy. #810-160-00*x*) board configuration option table

Config. Option	Base I/O Address	Interrupt Line
8	 300h	 IRQ 4
* 9	320h	 IRQ 5
10	 340h	 IRQ 2
11	 360h	 IRQ 3

* Not available in PC XT or equivalent when hard disk controller is present.

Figure 2.7 (*Continued*)
NE1000 (Assy. #810-160-00*x*) board configuration option table

Connector type

Refer to Figure 2.8 and note the jumper block used to make the connector type setting. Then, depending on the type of cable used, make the appropriate setting on each NE1000 (Assy. #810-160-00*x*) board as shown in Figure 2.8. You can set the connector type using either one 8-by-2 shorting plug or eight 1-by-2 shorting plugs.

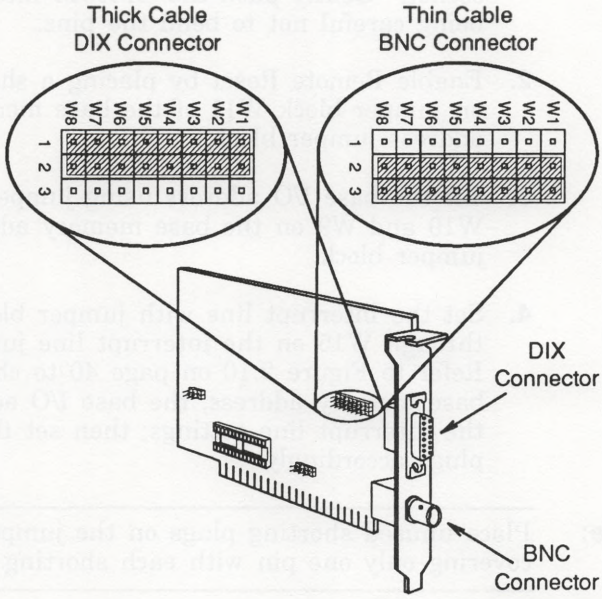


Figure 2.8
Connector type settings
for NE1000 (Assy. #810-160-00*x*) boards

Remote Reset

Remote Reset must be enabled on all NE1000 (Assy. #810-160-00*x*) boards that will use the Remote Reset feature. To install the Remote Reset EPROM and enable Remote Reset on an NE1000 (Assy. #810-160-00*x*) board, refer to Figure 2.9 and complete the following steps:

1. Insert the Remote Reset EPROM by aligning the notch and the pins on the EPROM with the notch and the pin receptacles on the EPROM socket. Gently push the EPROM into the socket, being careful not to bend the pins.

2. Enable Remote Reset by placing a shorting plug on jumper block W11 of the base memory address jumper block.

3. Set the base I/O address using jumper blocks W10 and W9 on the base memory address jumper block.

4. Set the interrupt line with jumper blocks W12 through W15 on the interrupt line jumper block. Refer to Figure 2.10 on page 40 to choose the base memory address, the base I/O address, and the interrupt line settings; then set the shorting plugs accordingly.

Note: Place unused shorting plugs on the jumper blocks, covering only one pin with each shorting plug.

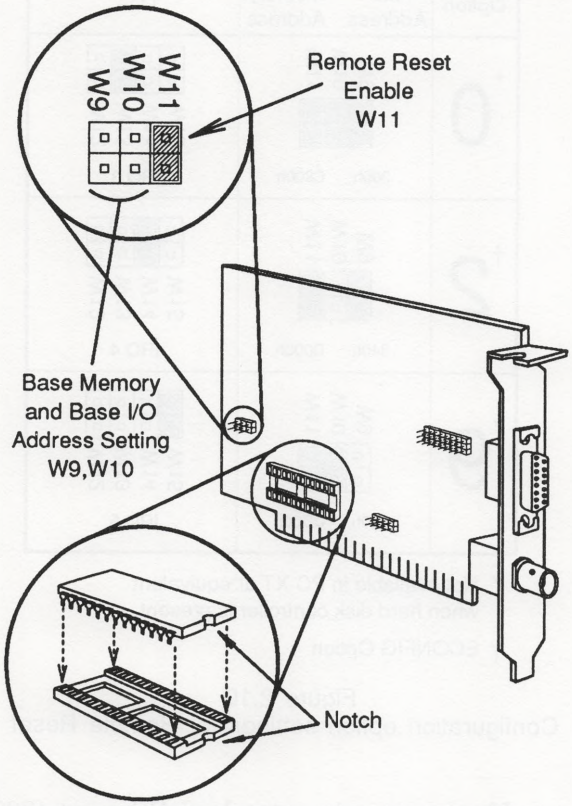
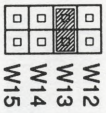
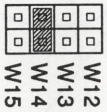
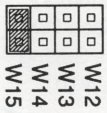


Figure 2.9
Installing a Remote Reset EPROM and enabling
Remote Reset on an
NE1000 (Assy. #810-160-00*x*) board

Config. Option	Base I/O Address	Base Memory Address	Interrupt Line
* 0		300h	C800h		IRQ 3
† 2		340h	D000h		IRQ 4
* 9		320h	CC00h		IRQ 5

* Not available in PC XT or equivalent when hard disk controller is present.

† ECONFIG Option

Figure 2.10
Configuration option settings for Remote Reset

If you are using standard Ethernet (802.3), choose configuration options 0 or 9.

If you configure NetWare for Ethernet II, choose configuration option 2. (If you run another operating system that uses a type code on your Ethernet cabling, use Ethernet II to avoid problems with packets.)

To insert an NE1000 board into a network station, turn to "Inserting network boards into ISA network stations" on page 52.

Setting options on NE2000 (Assy. #810-149-00*x*) boards

This section lists the default settings and explains how to make the following settings on NE2000 boards:

- Timing compatibility
- Configuration option
- Connector type
- Remote Reset

Default settings

The factory default settings for Novell NE2000 boards are 300h, IRQ3, Remote Reset disabled, BNC connector enabled, and W16 on.

Timing compatibility

The NE2000 network board is designed for use with ISA machines. You must remove a shorting plug if you install an NE2000 board in the following machines:

- COMPAQ 286 Portable machines
- IBM PC Model 30-286 machines
- Machines that use the Chips and Technologies chip set

In the above cases, complete the following steps to maintain complete timing compatibility for the listed machines:

1. Locate jumper block W16 on the NE2000 board by referring to Figure 2.11 on the following page.
2. Remove the shorting plug on jumper block W16.

   Place the unused shorting plug on the jumper block, covering only one pin with each shorting plug.

Note: Pre-Rev G NE2000 (Assy. #810-149-001) boards do not use a jumper to maintain timing compatibility. Refer to *Read Me First* (shipped with the board), part #123-000102-001, for instructions. (The Rev level is printed on the top center of the board, as shown in Figure 2.11 below.

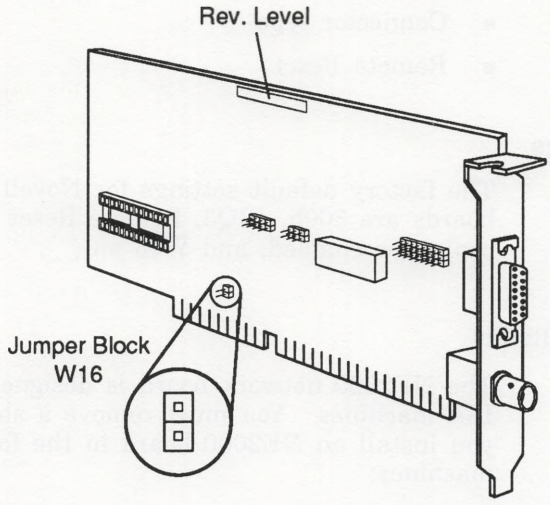


Figure 2.11
Location of Rev Level and
jumper block W16 on an NE2000 board

The configuration option

Set the configuration option for the NE2000 boards by completing the following steps for each board:

3. Locate the components used to make configuration option settings by referring to Figure 2.12.

4. Identify the configuration option you should use by checking the tag you attached to the board earlier in this section.

5. Refer to Figure 2.13 (beginning on page 45) to find the appropriate configuration option. Configuration option 0 is the default setting.

6. Set the interrupt line and base I/O address according to Figure 2.13. (The appropriate jumper block settings are located to the right of the configuration numbers in the table.)

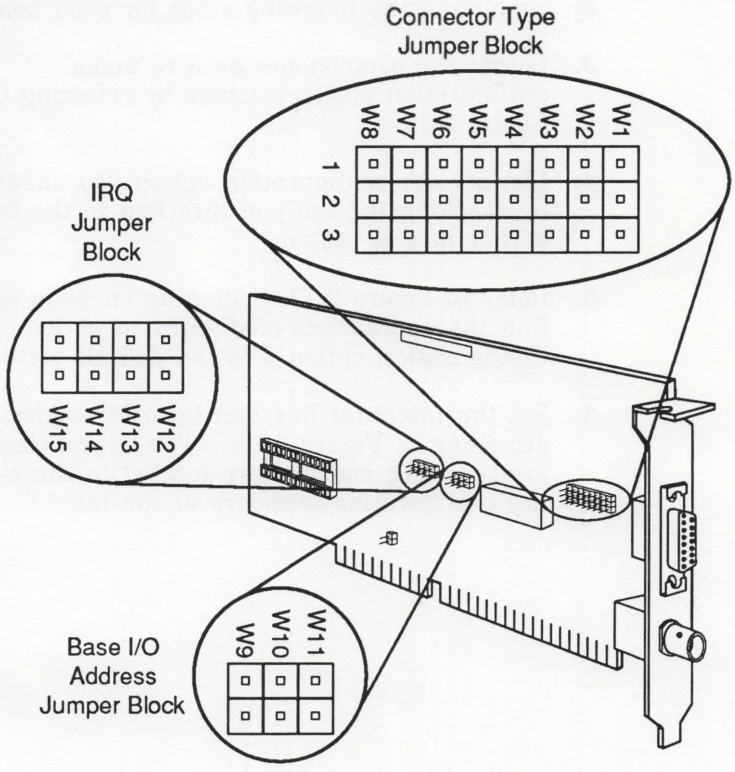


Figure 2.12
NE2000 board configuration option components

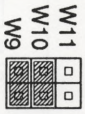
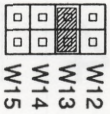
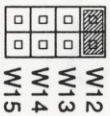
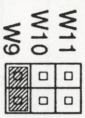
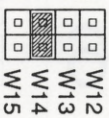
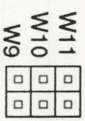
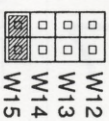
Config. Option	Base I/O Address	Interrupt Line
0	 300h	 IRQ 3
1	320h	 IRQ 2
2	 340h	 IRQ 4
3	 360h	 IRQ 5

Figure 2.13
NE2000 board configuration option table

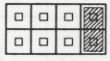
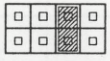
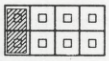
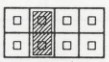
Config. Option	Base I/O Address	Interrupt Line
4	300h	 IRQ 2
5	320h	 IRQ 3
6	340h	 IRQ 5
7	360h	 IRQ 4

Figure 2.13 *(Continued)*
NE2000 board configuration option table

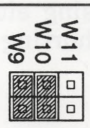
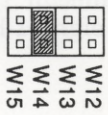
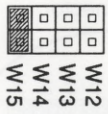
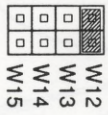
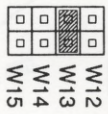
Config. Option	Base I/O Address	Interrupt Line
8	 300h	 IRQ 4
9	320h	 IRQ 5
10	340h	 IRQ 2
11	360h	 IRQ 3

Figure 2.13 *(Continued)*
NE2000 board configuration option table

Connector type

Refer to Figure 2.14 and note the jumper block used to make the connector type setting. Then make the setting on each NE2000 board that corresponds to the type of cable you are using. You can set the connector type using either one 8-by-2 shorting plug or eight 1-by-2 shorting plugs.

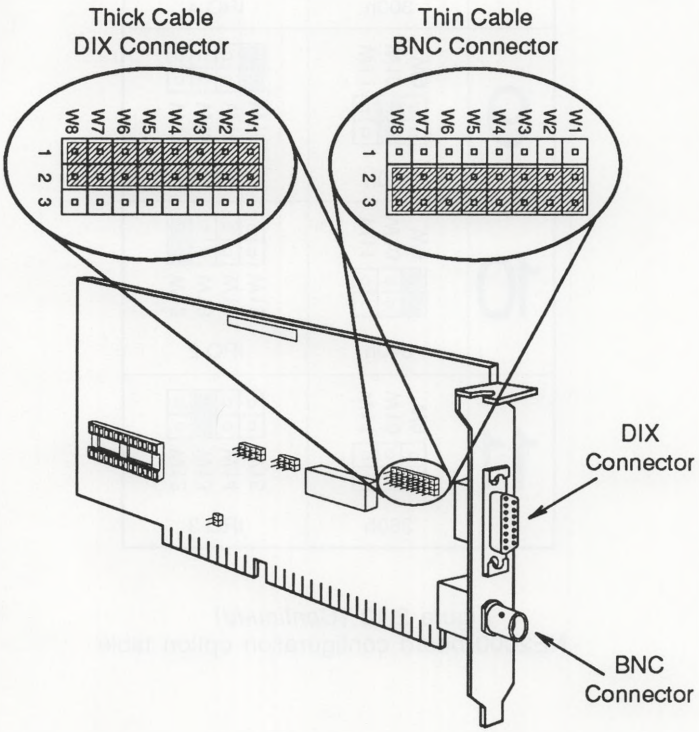


Figure 2.14
Connector type settings for NE2000 boards

Remote Reset

Remote Reset must be enabled on all NE2000 boards that will use the Remote Reset feature. To install a Remote Reset EPROM and enable Remote Reset on an NE2000 board, refer to Figure 2.15 and complete the following steps:

1. Insert the Remote Reset EPROM by aligning the notch and the pins on the EPROM with the notch and the pin receptacles on the EPROM socket. Gently push the EPROM into the socket, being careful not to bend the pins.

2. Enable Remote Reset by placing a shorting plug on jumper block W11 of the base memory address jumper block.

3. Set the proper base memory address and base I/O address using jumper blocks W10 and W9 on the base memory address jumper block.

4. Set the proper interrupt line with jumper blocks W12 through W15 on the interrupt line jumper block.

   Refer to Figure 2.16 on page 51 to choose the base memory address, base I/O address, and interrupt line settings for your boards; then set the shorting plugs accordingly.

Note: Place unused shorting plugs on the jumper blocks, covering only one pin with each shorting plug.

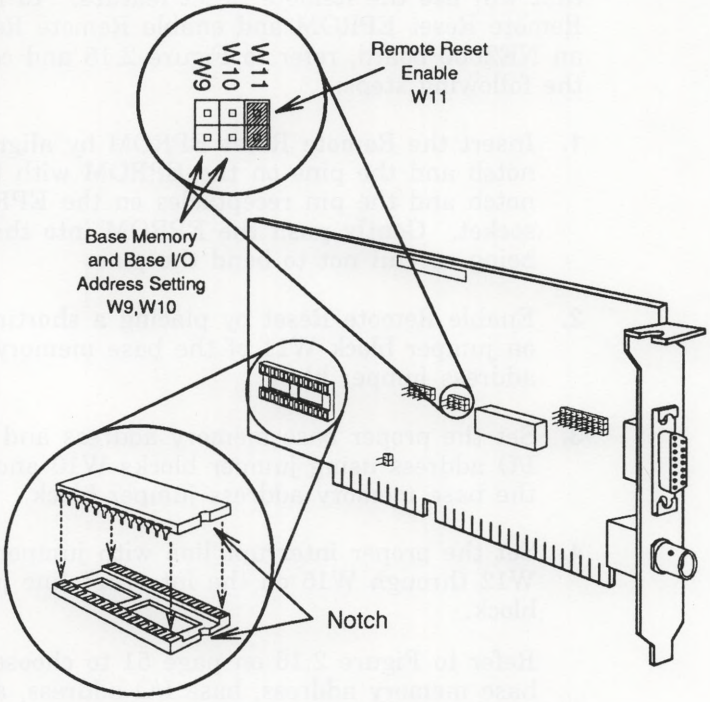
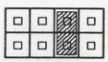
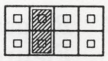
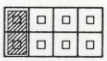


Figure 2.15
Installing a Remote Reset EPROM and
enabling Remote Reset on an NE2000 board

Config. Option	Base I/O Address	Base Memory Address	Interrupt Line
0		300h	C800h		IRQ 3
†2		340h	D000h		IRQ 4
9		320h	CC00h		IRQ 5

† ECONFIG Option

Figure 2.16
Configuration option settings for Remote Reset

If you are using standard Ethernet (802.3), choose configuration options 0 or 9.

If you configure NetWare for Ethernet II, choose configuration option 2. (If you run another operating system that uses a type code on your Ethernet cabling, use Ethernet II to avoid problems with packets.)

To insert an NE2000 board into a network station, turn to "Inserting network boards into ISA network stations" on page 52.

Inserting network boards into ISA network stations

After you have made the proper settings on the Novell NE1000 and NE2000 Ethernet boards, insert them into the appropriate network stations by completing the following steps:

1. Turn off the power switches on all stations and peripherals.

2. Remove the cover of each station according to the manufacturer's instructions.

3. Remove a metal expansion bracket as shown in Figure 2.17 below.

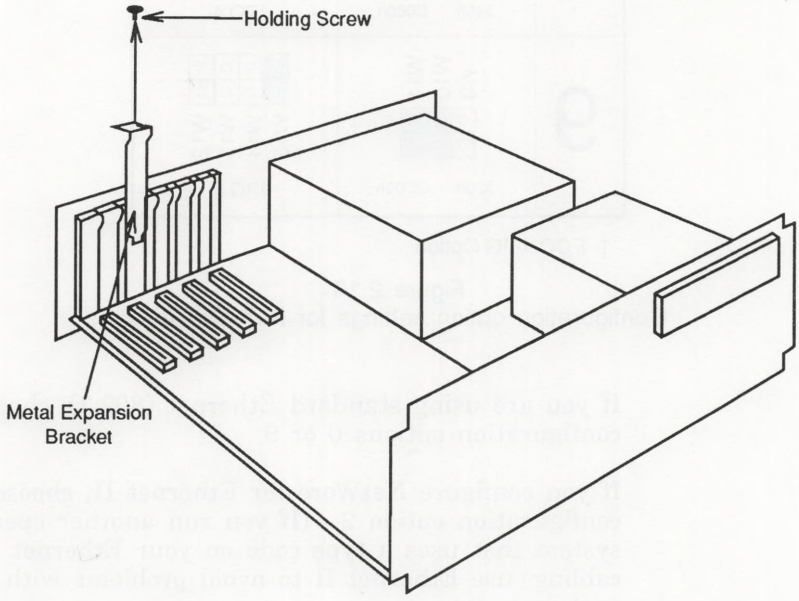


Figure 2.17
Removing a metal expansion bracket from a network station

4. Insert the appropriate Novell Ethernet board into the slot, pressing it firmly into the expansion slot connector. (See Figure 2.18.)

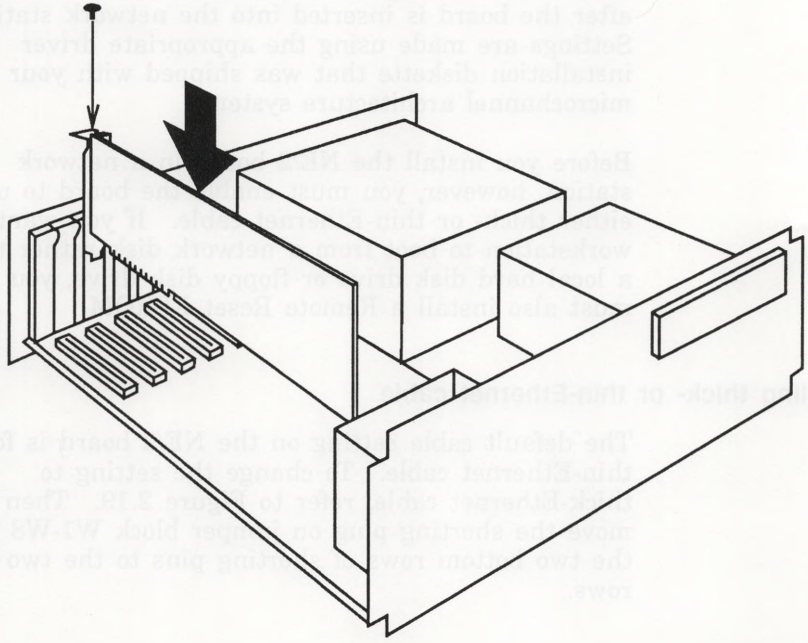


Figure 2.18
Inserting a network board
into a network station

5. Replace the covers of your network stations.

If you have any NE/2 boards to install, continue with the next section.

If you do not have any NE/2 boards to install and have completed the installation of your NE1000 and NE2000 boards, skip to the section summary on page 62.

Installing NE/2 boards into microchannel machines

Most of the settings for the NE/2 board are made after the board is inserted into the network station. Settings are made using the appropriate driver installation diskette that was shipped with your microchannel architecture system.

Before you install the NE/2 board in a network station, however, you must enable the board to use either thick- or thin-Ethernet cable. If you want the workstation to boot from a network disk rather than a local hard disk drive or floppy disk drive, you must also install a Remote Reset EPROM.

Enabling thick- or thin-Ethernet cable

The default cable setting on the NE/2 board is for thin-Ethernet cable. To change the setting to thick-Ethernet cable, refer to Figure 2.19. Then move the shorting plug on jumper block W1-W8 from the two bottom rows of shorting pins to the two top rows.

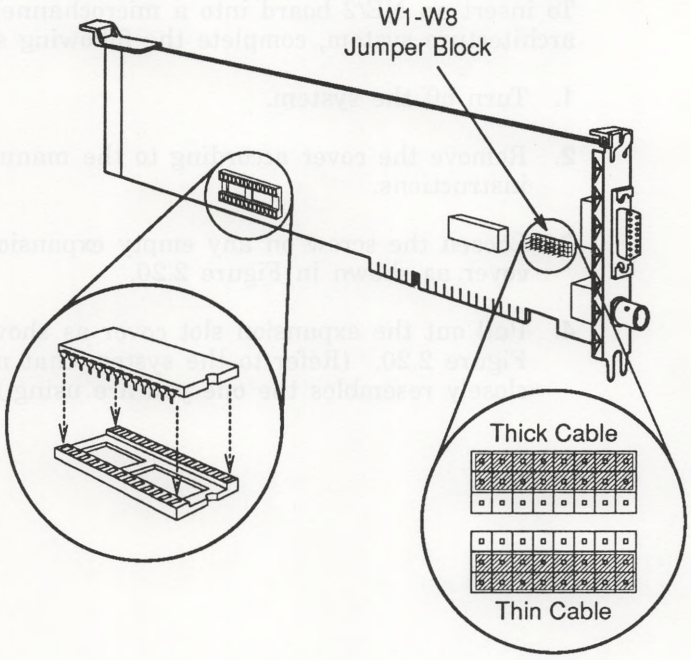


Figure 2.19
Locating settings on the NE/2 board

Setting Remote Reset on the NE/2 Board

The Remote Reset feature allows workstations to boot from a network disk instead of from a local hard disk drive or floppy disk drive. You must enable Remote Reset in all workstations that will use this feature.

To add the Remote Reset feature to a workstation, insert the Remote Reset boot EPROM into socket U33, as shown in Figure 2.19. Be sure to align the notch and the pins on the EPROM with the notch and pin receptacles on the EPROM socket as shown. Gently push the EPROM into the socket, being careful not to bend the pins. You are now ready to insert the NE/2 board into the workstation.

Inserting an NE/2 board

To insert an NE/2 board into a microchannel architecture system, complete the following steps:

1. Turn off the system.
2. Remove the cover according to the manufacturer's instructions.
3. Loosen the screw on any empty expansion slot cover as shown in Figure 2.20.
4. Pull out the expansion slot cover as shown in Figure 2.20. (Refer to the system that most closely resembles the one you are using.)

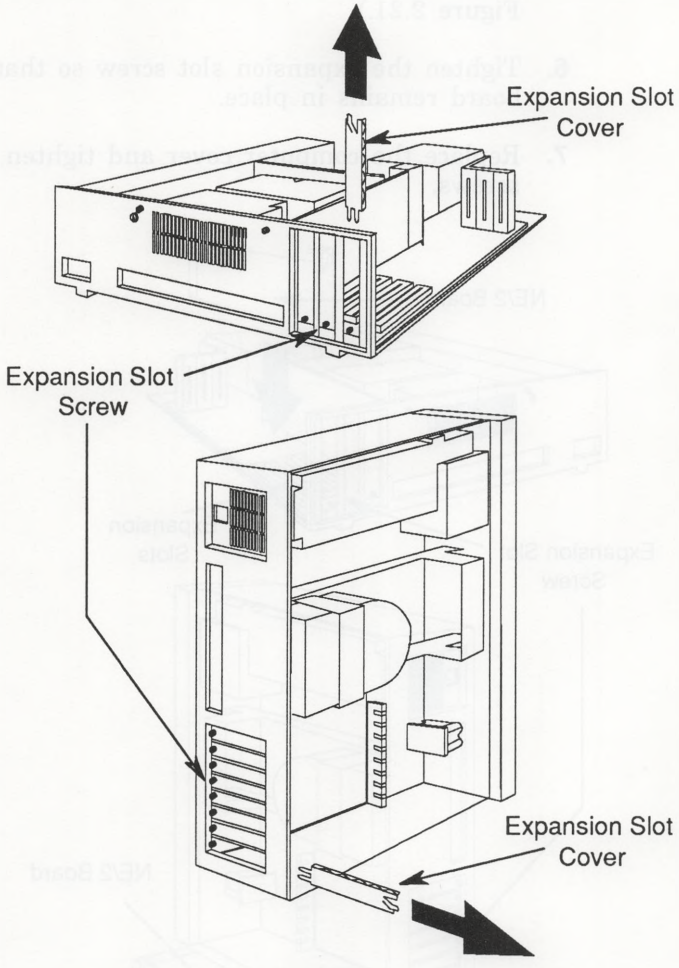


Figure 2.20
Removing an expansion slot cover

5. Insert the NE/2 board into the slot, pressing it firmly into the expansion slot connector. (See Figure 2.21.)

6. Tighten the expansion slot screw so that the board remains in place.

7. Replace the computer cover and tighten the cover screws.

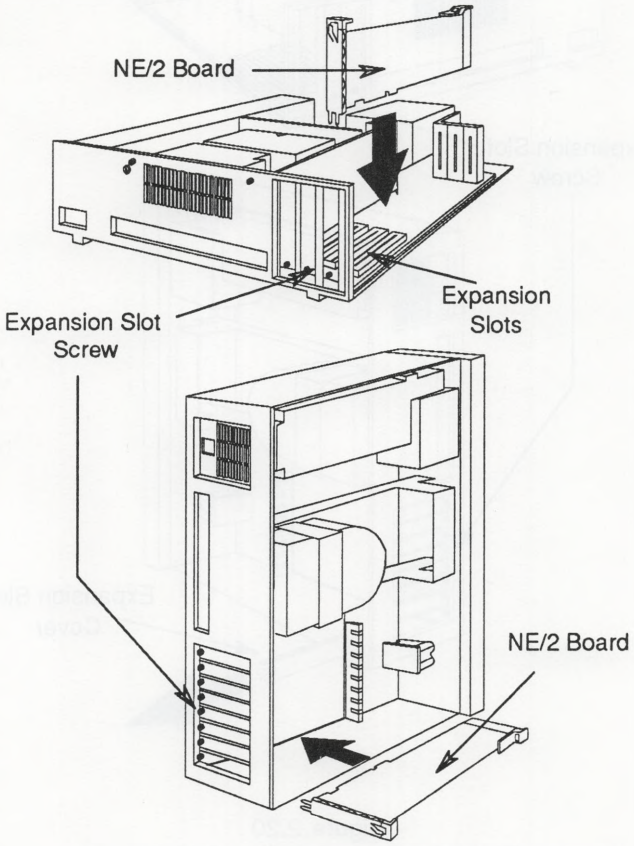


Figure 2.21
Inserting an NE/2 board
into a microchannel architecture system

Making software settings on the NE/2 board

The following instructions explain what you need to do before you can set the interrupt line, base I/O address, and the boot EPROM address on the NE/2 board.

Because you set the board by running the *REFERENCE* (or similarly named) diskette that was shipped with your microchannel architecture system, you need a working copy of this diskette. If you have not made a working copy of the diskette, do so before continuing with these instructions.

You also need the *LAN_DRV_109* diskette that came with the NE/2 board.

Consult the manual that came with your microchannel architecture system in order to copy the NE/2 option files and view the station's board configuration.

The following section explains how to set the configuration option on the NE/2 board after you have copied the NE/2 option files to the *REFERENCE* (or similarly named) diskette.

Setting the configuration option

The NE/2 configuration option setting consists of the interrupt line, the base I/O address, and the boot EPROM address. You must change the settings on the screen as necessary so that they match the settings included in the configuration option you selected for the station. (You labeled each board with its configuration option earlier in this section.) You must change the settings on the screen as follows:

- **File server or bridge.** You must change the setting on the screen as necessary so that it matches the the configuration option you chose when you generated the operating system or configured the bridge software.
- **Workstation.** You can choose any combination of configuration option settings from the chart on page 61 (except as noted below).

You must choose an interrupt line that does not conflict with the interrupt line of other boards in the station. (Some driver installation programs allow duplicate interrupt lines, but the NetWare operating system does not.)

Follow the manufacturer's instructions to change a configuration option setting on the screen.

Possible NE/2 board configuration option settings are listed in the table on the next page.

Option	Interrupt Line	Base I/O Address	EPROM Address*
0	3	1000h-102Fh	0C8000h-0C9FFFh
1	4	1000h-102Fh	0C8000h-0C9FFFh
2	5	1000h-102Fh	0C8000h-0C9FFFh
3	9	1000h-102Fh	0C8000h-0C9FFFh
4	3	2020h-204Fh	0CA000h-0CBFFFh
5	4	2020h-204Fh	0CA000h-0CBFFFh
6	5	2020h-204Fh	0CA000h-0CBFFFh
7	9	2020h-204Fh	0CA000h-0CBFFFh
8	3	8020h-804Fh	0CC000h-0CDFFFh
9	4	8020h-804Fh	0CC000h-0CDFFFh
10	5	8020h-804Fh	0CC000h-0CDFFFh
11	9	8020h-804Fh	0CC000h-0CDFFFh
12	3	A0A0h-A0CFh	0CE000h-0CFFFFh
13	4	A0A0h-A0CFh	0CE000h-0CFFFFh
14	5	A0A0h-A0CFh	0CE000h-0CFFFFh
15	9	A0A0h-A0CFh	0CE000h-0CFFFFh
16	3	B0B0h-B0DFh	0D0000h-0D1FFFh
17	4	B0B0h-B0DFh	0D0000h-0D1FFFh
18	5	B0B0h-B0DFh	0D0000h-0D1FFFh
19	9	B0B0h-B0DFh	0D0000h-0D1FFFh
20	3	C0C0h-C0EFh	0D2000h-0D3FFFh
21	4	C0C0h-C0EFh	0D2000h-0D3FFFh
22	5	C0C0h-C0EFh	0D2000h-0D3FFFh
23	9	C0C0h-C0EFh	0D2000h-0D3FFFh
24	3	C3D0h-C3FFh	0D4000h-0D5FFFh
25	4	C3D0h-C3FFh	0D4000h-0D5FFFh
26	5	C3D0h-C3FFh	0D4000h-0D5FFFh
27	9	C3D0h-C3FFh	0D4000h-0D5FFFh

* The EPROM address can be disabled for each option.

After you have set the configuration option for the NE/2 board, save the changes and exit from the program.

Return to "Setting the configuration option" on page 60 and repeat the instructions for each station in your network that has an NE/2 board installed. Once you have completed hardware and software installation of the NE/2 boards, continue with the section summary below.

Summary

In this section you set the Novell Ethernet network boards and installed them in network stations.

If you are installing NE/2-32 boards in your file server or workstations, continue with the next section.

If you are installing NE3200 boards in an EISA file server, skip to Appendix B.

If you have installed and set all Novell Ethernet boards you plan to use in the network, skip to Section 4 to cable the network.

Section 3: Installing and setting NE/2-32 boards

This section explains how to install and set NE/2-32 network boards (Assy. #810-182-001) in microchannel machines.

The NE/2-32 board can be used in workstations and file servers for NetWare v3.*x* networks. It must be installed in a 32-bit microchannel slot.

Because Novell Ethernet boards can be connected to either thin- or thick-Ethernet cable, the NE/2-32 board can be used in a network that uses either type of cable or a combination of the two.

The NE/2-32 board is configured by software, using the REFERENCE (or similarly-named) program. This section explains how to make the following settings:

- Interrupt line (IRQ)
- Base I/O address
- Base memory (RAM) address
- Connector type

Labeling network boards

To simplify network setup and administration, record configuration information on a label attached to each network board.

Refer to the diagram of the network layout you were advised to make in Section 1 and to the worksheets you filled out when you installed the v3.*x* NetWare operating system and prepared the workstation shell files. (The worksheets are in the main NetWare installation manual.)

Using a string tag, an adhesive label, or some other form of identification, label each board with

- **The type of network station** into which the board will be inserted: workstation or file server.
- **The specific station** into which the network board will be inserted. Identify the station by its intended physical location or user.
- **Configuration settings.** Specify settings for the interrupt line, the base memory (RAM) address, and base I/O address. Use the factory-set default settings where possible (however, you can choose any setting that does not conflict with the resource values required by other devices in the machine).

  See the chart below for configuration settings:

Parameter	Default	Other Supported Values
Interrupt Line	3	4, 5, 9, 10, 11
Base I/O Address	3000h	4000h, 5000h, 6000h, 7000h, 9000h, D000h
Base Memory Address	000C0000h	000D0000h, FFF90000h, FFFA0000h, FFFB0000h, FFFC0000h, FFFD0000h

Note: DOS workstations require either 000C0000h or 000D0000h for the memory address. Because other supported memory address values use protected mode, use them for file servers only.

If you install two NE/2-32 boards in the same station, each board must have a unique setting for each parameter.

The settings you select to configure the file server board must match the LAN driver settings in the server operating system. When you set the workstation board, the LAN driver in the workstation file configures itself to the board setting when you boot the computer.

Tip: When you use the same type network board in many workstations, you can simplify creating workstation shell files and boot diskettes if you use the same configuration settings for each of these network boards (as long as none of the stations has conflicting settings for other devices).

- **The connector type.** Each Novell Ethernet board has both a BNC connector and a DIX connector on the mounting bracket. The BNC connector is used with thin cable (Cheapernet); the DIX connector is used with thick cable. You must "inform" each board whether it will be connected to thick or thin cable. The connector type is selected by using the REFERENCE (or similarly-named) program. Write "DIX" (for thick cable) or "BNC" (for thin cable) on the label.

Installing an NE/2-32 board

The NE/2-32 board is set using the REFERENCE (or similarly named) program that came with your microchannel machine and the driver diskette *NW 386 LAN DRV* that came with your NE/2-32 board. The NE/2-32 board must be inserted into the file server before the configuration settings can be made.

For instructions on inserting an NE/2-32 board in a file server, refer to the manual that came with your microchannel machine.

The NE/2-32 board must be inserted into a 32-bit microchannel slot.

After inserting the NE/2-32 board into your machine, continue with the next section.

Setting the configuration for the NE/2-32 board

Settings on the NE/2-32 board are made by running the setup program on the *REFERENCE* (or similarly named) diskette that came with your microchannel machine.

If you have not made a working copy of the *REFERENCE* (or similarly named) diskette, do so before continuing with these instructions. You also need the *NW 386 LAN DRV* option diskette that you received with the NE/2-32 board.

1. Copy the @7151.ADF file from the option diskette to the *REFERENCE* (or similarly named) diskette. (See the manual that came with your microchannel machine for instructions.)

2. Use the REFERENCE (or similarly named) program and follow the manufacturer's instructions to change a configuration setting on the screen.

   The NE/2-32 configuration option setting consists of the interrupt line, the base memory address, and the I/O address. You must change the settings on the screen as necessary so that they match the settings specified in the configuration option you selected for the station. (You labeled each board with its configuration option earlier in this section.)

   - You must choose an interrupt line that does not conflict with the interrupt line of other boards in the station.

   - You must choose C0000h or D0000h as the memory address for a DOS workstation. (Because other supported values require protected mode, they should be selected for file servers only.)

   If you have more than one NE/2-32 board in your file server, each board must be configured and each configuration must be unique.

3. After the settings are selected on the screen for each board in the machine, save the changes and exit the program.

Where to go from here

Once you have completed the hardware and software installation of all network boards for the file server and workstations, continue with Section 4 of this manual to cable the Ethernet network.

You must cable the network before you load the drivers. For information on loading, upgrading, or changing parameters of drivers, see the appropriate NetWare system administration, installation, or maintenance manual.

Notes

Section 4: Cabling the network

Now that you have set and installed each network board, you are ready to cable all network stations together. This section explains how to cable a thin-Ethernet cable network, a thick-Ethernet cable network, and a thin/thick-Ethernet cable network.

Follow the guidelines below as you install your cable network:

- Turn off each network station.
- Install one trunk segment at a time if you are installing more than one.
- Do not crimp the cable, damage its insulation, or run the cable near heat sources or fluorescent light fixtures, or in heavy traffic areas where hand trucks or rolling chairs might damage it.

Cabling a thin-Ethernet cable network

The order of the steps you follow to assemble each trunk segment is not important. For example, you could place your network stations and peripherals first. Then, you could create your trunk segment cable(s). (Figure 4.1 illustrates a thin-Ethernet cable trunk segment.) Finally, you could connect the T-connectors directly to the BNC connector jacks on the network boards installed in each station.

Similarly, you could place your network stations and peripherals first, attach a T-connector to each network board in each station next, and then connect the T-connectors together with cables.

Remember to attach a BNC terminator to each end of the trunk segment. One of these terminators should have a grounding wire attached. Attach the end of the grounding wire to an earth ground (the middle screw of an AC outlet). If the grounding wire is too short to reach the outlet, use 16- or 18-gauge insulated wire to extend the grounding wire.

Trunk segments are connected to each other with repeaters. To connect two trunk segments to a repeater, attach one end of each trunk segment directly to the repeater (as if the repeater were another workstation).

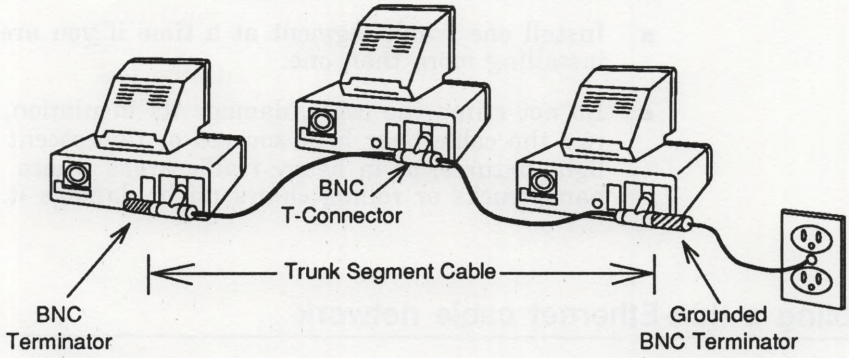


Figure 4.1
Thin-Ethernet cable network

Cabling a thick-Ethernet cable network

If you plan to use only thick-Ethernet cable, install each trunk segment as explained below:

1. Place the stations and peripherals in their predetermined locations, according to your network plan.

2. Install the transceivers according the manufacturer's directions and your network plan.

3. Connect the transceivers to the thick cable.

4. Refer to Figure 4.2 below to use the slide lock on the female DIX connector and attach the connector on the transceiver cable to the transceiver. Slide the lock to "open," attach it to the transceiver, and then slide the lock back to "lock." The slide lock prevents accidental disconnection.

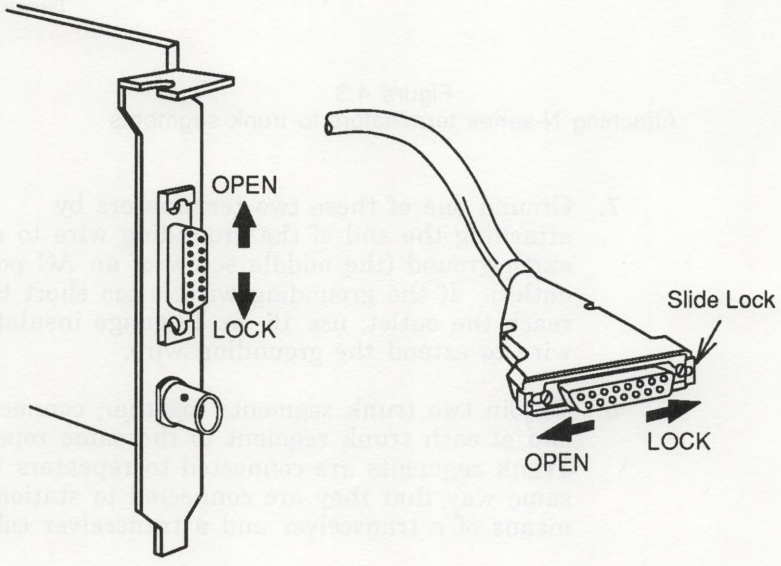


Figure 4.2
Using the slide lock

5. Attach the male DIX connector to the network board.

6. Attach an N-series terminator to each end of the trunk segment. One terminator should have a grounding wire attached as shown in Figure 4.3 below.

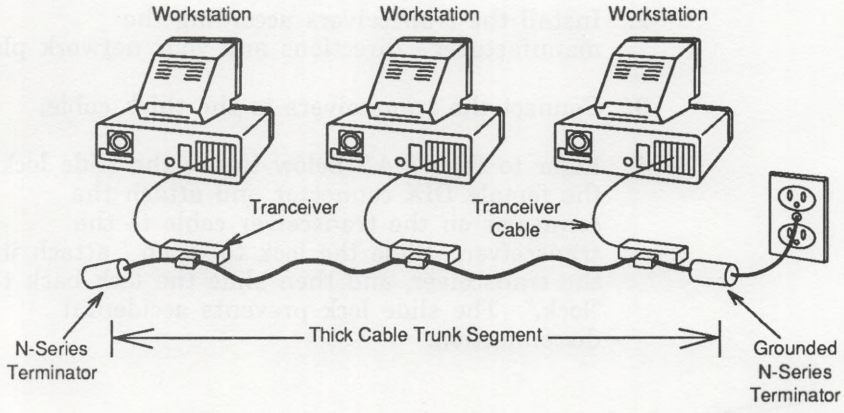


Figure 4.3
Attaching N-series terminators to trunk segments

7. Ground one of these two terminators by attaching the end of the grounding wire to an earth ground (the middle screw of an AC power outlet). If the grounding wire is too short to reach the outlet, use 16- or 18-gauge insulated wire to extend the grounding wire.

8. To join two trunk segments together, connect one end of each trunk segment to the same repeater. Trunk segments are connected to repeaters in the same way that they are connected to stations (by means of a transceiver and a transceiver cable).

Cabling a thin/thick-cable network

If you plan to use thin and thick cable in the same trunk segment, read the directions on pages 71 through 74 before cabling your network. Be sure to follow the limits and rules that apply to your network layout. Remember to use adapters to connect thin and thick cable.

Summary

This section explained how to cable the various types of Ethernet networks.

Where to go from here

For information on loading, upgrading, or changing parameters of drivers, see the manual that referred you to this supplement or refer to the appropriate NetWare installation or system administration manual.

All file servers, bridges (routers), and workstations on the same cabling scheme should use the same frame assignment for their drivers and shells. (Communication is possible only between like frame formats.) For configuration instructions for Ethernet II, consult the NetWare documentation master index for information on ECONFIG if you have either DOS IPX workstations or a bridge (router), or if you plan to run NetWare 2.*x* on the server.

If you plan to have workstations use Remote Reset. You have additional tasks to complete:

- **For DOS IPX workstations.** Use DOSGEN to create a boot image file. Instructions for using DOSGEN are in *NetWare v3.11 Installation* and in *NetWare v2.2 Using the Network*.

- **For DOS ODI workstations.** Include RPLODI.COM with the workstation files and add it to the AUTOEXEC.BAT file after LSL and before *drivername*. For further information, see "Managing DOS workstations" in *NetWare v2.2 Using the Network*.

  Then use DOSGEN to create a boot image file. Instructions for using DOSGEN are in *NetWare v3.11 Installation* and in *NetWare v2.2 Using the Network*.

If the workstations use IBM generic boot ROMs for Remote Reset. You must copy additional files to the file server:

- **For NetWare v2.*x* file servers.** Copy RPL.VP1 to SYS:SYSTEM and ETHER.RPL to SYS:LOGIN. For instructions on loading VAPs, see *NetWare v2.2 Using the Network*.

- **For NetWare v3.*x* file servers.** Copy ETHERRPL.NLM to SYS:SYSTEM. Use the LOAD command to load ETHERRPL.NLM. Then bind it to the appropriate LAN driver. For information on ETHERRPL.NLM, refer to the *NetWare v3.11 System Administration*.

Appendix A: File server board settings for NetWare v3.*x*

Use this appendix to set file server boards on NetWare v3.*x* networks. The following options are given for the Novell Ethernet NE1000 (Assy. #950-054401), NE1000 (Assy. #810-160-00*x*), and NE2000 (Assy. #810-149-00*x*) network boards:

- Interrupt line
- Base I/O address

A perspective of each board shows the setting locations and includes the setting options.

For NE/2 and NE/2-32 board settings, refer to the "Load LAN Drivers" section of *NetWare 386 System Administration*.

To set NE/2 or NE/2-32 file server boards, copy the appropriate files from the option or driver diskette that came with the board to a working copy of the *REFERENCE* or setup diskette that came with the machine. (For the NE/2 board, copy the NE/2 option files. For the NE/2-32 board, copy the .ADF file.) Then run the REFERENCE or setup program to make software settings.

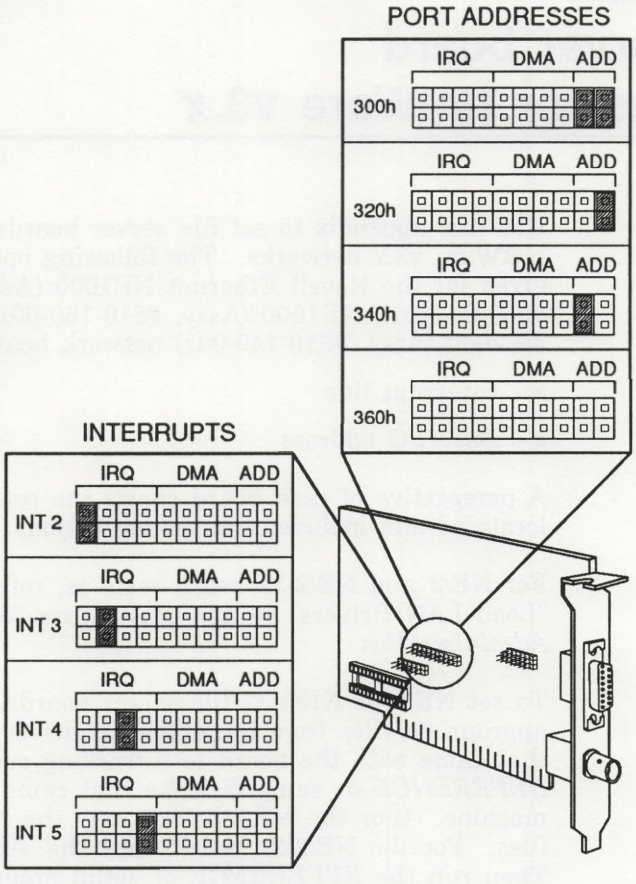


Figure A.1
NE1000 (Assy. #950-054401) file server board setting options for NetWare v3.*x*

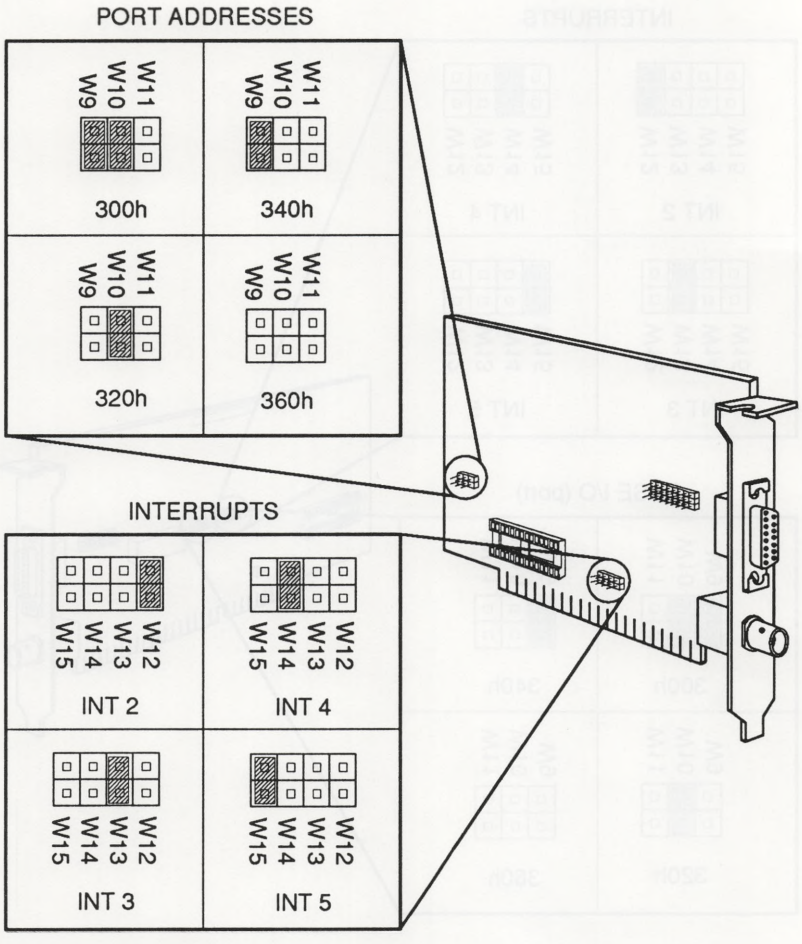


Figure A.2
NE1000 (Assy. #810-160-00*x*) file server board
setting options for NetWare v3.*x*

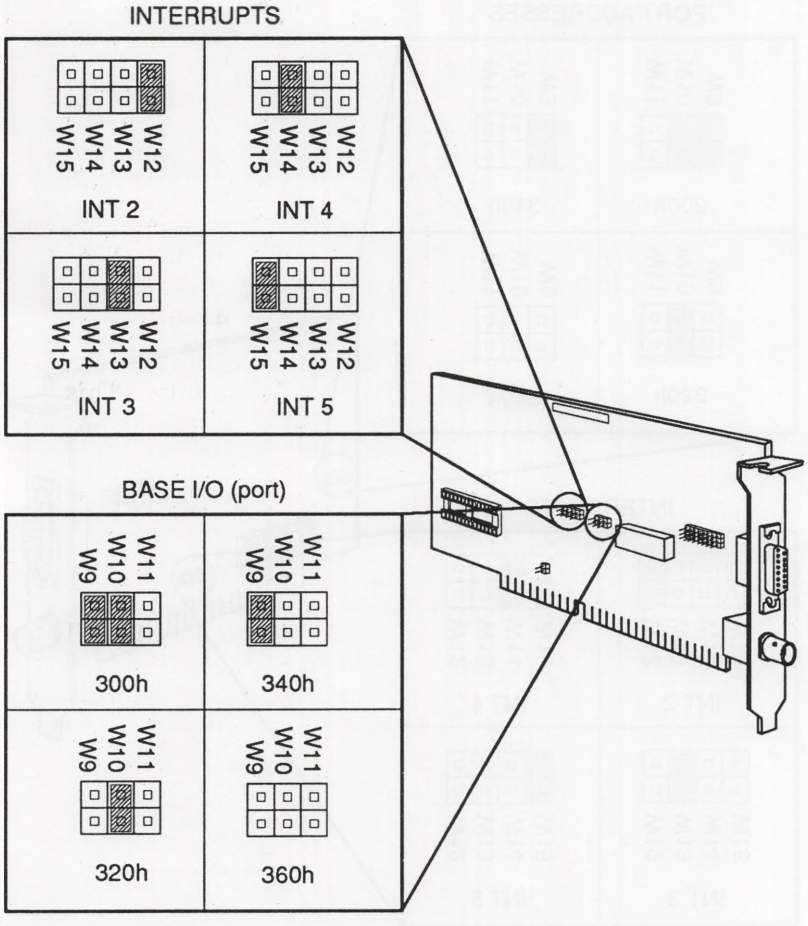


Figure A.3
NE2000 (Assy. #810-149-00*x*) file server board
setting options for NetWare v3.*x*

Appendix B: Installing and configuring the NE3200 file server board

This appendix explains how to install and configure the NE3200 file server board (Assy. #810-187-001) in Extended Industry Standard Architecture (EISA) machines. Each NE3200 must be installed in a 32-bit EISA bus master slot. (For the appropriate slots, refer to your EISA computer manual.)

The NE3200 board is configured by software, using the EISA system configuration utility. This appendix explains how to make the following settings:

- Interrupt
- Connector type

If you set interrupts, you are limited to five NE3200 boards in a machine (because only five interrupts are supported). If you disable interrupts for all boards, you can install as many as six NE3200 boards in a file server. We recommend that all boards in one machine either have interrupts disabled or else have interrupts set.

Labeling network boards

To simplify network setup and administration, record configuration information on a label attached to each network board.

Refer to the diagram of the network layout you were advised to make in Section 1 of this manual and to the worksheets you filled out when you installed the NetWare v3.*x* operating system. (The worksheets are in the main NetWare installation manual.)

Using a string tag, an adhesive label, or some other form of identification, label each board with

- **The file server** into which the board is to be inserted.
- **The connector type.**

  Each Novell NE3200 Ethernet board has both a BNC connector (for thin cable) and a DIX connector (for thick cable) on the mounting bracket. You must configure the board (with the configuration utility) to enable either the BNC or DIX. Write "DIX" (for thick cable) or "BNC" (for thin cable) on the label.
- **The interrupt type.**

  The NE3200 board is designed to provide high performance with or without interrupts, depending on the environment.

  If you want to use the maximum of six boards, you must disable interrupts. However, if you use a CPU-intensive NetWare Loadable Module (NLM) when interrupts have been disabled, performance can be degraded.

  If you set interrupts, you are limited to five NE3200 boards in the file server (because the driver supports only five interrupts). Even though an interrupt is set, the driver operates in polled mode (just as it does when the interrupt is disabled). The driver uses the interrupt as a backup if insufficient packet receive buffers are available. (If you set interrupts and want to check whether you can disable the interrupts and install a sixth board, load MONITOR and locate the counter for the "Number of Interrupts fired by Adapter." If the counter increments in bursts during peak utilization, retain the interrupt setting to maintain performance.)

Note: If you set interrupts, we suggest you select "Level triggered" interrupts rather than "Edge triggered" interrupts.

Indicate your choice on the board label.

Installing an NE3200 board

Because the NE3200 board is set using the system configuration utility that accompanies the EISA machine, you must first install the board.

The NE3200 board must be inserted into a 32-bit EISA bus master slot. For instructions on inserting an NE3200 board into a file server, refer to the manual that came with your EISA machine. Be sure to press it completely into the expansion slot connector.

After inserting the NE3200 board into your machine, continue with the next section.

Setting the configuration for the NE3200 board

Settings on the NE3200 board are made by running the EISA system configuration utility that came with your EISA machine. If you have more than one NE3200 board in your file server, each board must be configured and each configuration must be unique.

If you have not made a working copy of the EISA *CONFIGURATION* (or similarly named) diskette that came with your EISA system, do so before continuing with these instructions. You also need the *NW 386 LAN DRV NE3200* diskette that came with the NE3200 board.

To configure the NE3200 board, complete the following steps:

1. Copy the !NVL07*xx*.CFG file from the *NW 386 LAN DRV NE3200* option diskette to the working copy of the *CONFIGURATION* (or similarly named) diskette that came with your EISA machine. (See the manual that came with your EISA machine for instructions.)

2. Use the CONFIGURATION (or similarly named) program, and follow the manufacturer's instructions to change a configuration setting on the screen.

3. Select the connector type on the screen according to the type of Ethernet cable you plan to use, thin (BNC) or thick (DIX). The default is BNC.

4. Select the interrupt type on the screen. Your choices are "Disable interrupts," "Level-triggered," and "Edge-triggered" interrupts. (See page 80 for information on interrupts).

   The configuration utility automatically selects the next available interrupt, but does not display the interrupt number on the screen. (You can go into edit mode to change resources if you want to view or specify the interrupt.)

5. After you make the configuration settings for each NE3200 board in your file server, save the changes and exit the program. Exiting the program will reset your EISA system with the new configuration.

Where to go from here

Now that you have completed the hardware and software installation of all boards for your file server, you must cable the network before you load the driver. For instructions on cabling the network, go to Section 4 of this manual.

The driver for the NE3200 board is a NetWare Loadable Module (NLM). For information on loading the NE3200.LAN driver and specifying driver parameters, see the "LOAD LAN Driver" section in *NetWare v3.11 System Administration*.

Note: If you selected "Disable interrupts," you hear a beep when you load the driver. The following message displays:

```
No interrupt was selected.
```

If you planned to use the board without interrupts, you have had your selection confirmed.

If you planned to set interrupts, you have been reminded to run the configuration utility again.

When you load the driver, you can specify the following parameters (you should also include them in the STARTUP.NCF file):

- Frame
- Slot
- Name

You cannot otherwise configure the driver at the command line (the driver reads the configuration from the board). If you want to make changes, you must run the configuration utility again.

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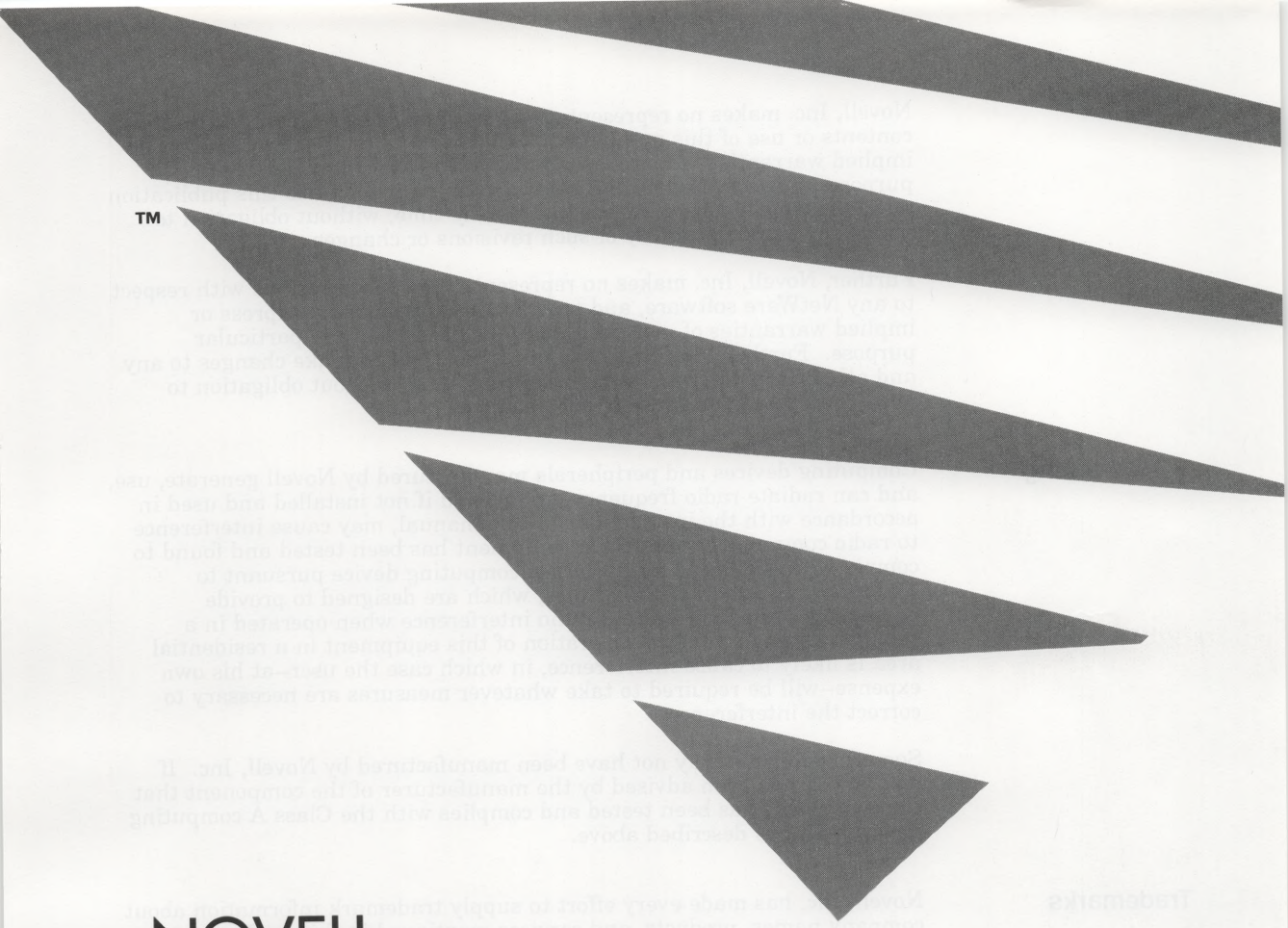

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How to Use This Manual

This manual explains how to install Novell RX-Net hardware on a NetWare network. It is a supplement to the main NetWare manuals.

If you have not already done so, read and follow the instructions in your main NetWare manual up to the point where it advises you to consult this supplement.

Manual organization

This manual contains four sections.

Section 1: Planning your network

Reviews types of ARCNET networking hardware and the Novell RX-Net and Standard Microsystems Corporation network boards in this supplement. It also provides rules and limitations for ARCNET network layout and explains how to define and plan your network.

Section 2: Configuring RX-Net II network boards

Gives instructions for configuring and installing the RX-Net II (SMC PC120) board in standard-bus architecture (ISA) machines used as workstations, routers (bridges), and file servers running NetWare v2.*x* or v3.*x*.

Section 3: Configuring RX-Net/2 network boards

Gives instructions for configuring and installing the RX-Net/2 (SMC PS110) network board in microchannel architecture machines used as workstations, routers (bridges), and file servers running NetWare v2.*x* or v3.*x*.

Section 4: Cabling your network

Gives instructions for cabling your ARCNET network.

Note: Any and all references to routers in this manual also apply to bridges.

Other Manuals

For information on loading the RX-Net LAN drivers for NetWare v3.*x*, see the "LOAD LAN driver" section of *NetWare System Administration*. For information on linking the RX-Net LAN drivers for NetWare v2.*x*, see "The linking and configuring module" in the Installation section of *Installing and Maintaining the Network*.

Note: The Standard Microsystems Corporation PC120 board is equivalent to the Novell RX-Net II board.

The Standard Microsystems Corporation PS110 board is equivalent to the Novell RX-Net/2 board.

Any and all references to the RX-Net II and RX-Net/2 boards also apply to the SMC-equivalent boards listed above.

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Notes

Section 1: Planning your network

This section helps you do the following:

- Review network hardware.
- Review the hardware requirements and rules and limitations for Novell RX-Net ARCNET networks.
- Design your own network layout and make sure that you have all the necessary hardware to set up your network.

Use the following chart to locate the information you need:

Information	Page
Network hardware	2
Network layout	4
Planning your network layout	6

Note: All information about the RX-Net II board applies to the Standard Microsystems Corporation PC120 board as well. The two boards are identical.

All information about the RX-Net/2 board applies to the Standard Microsystems Corporation PS110 board as well. The two boards are identical.

Each station in an ARCNET network contains a network board to allow cabled stations to communicate with each other and with the file server.

From the file server, the cable attaches to either a passive or an active hub. These hubs act as signal splitters; the active hub also acts as a signal amplifier. From an active hub, the cable can be connected to another hub or to a station. From a passive hub, however, the cable can be connected only to a network station.

An ARCNET network uses several other pieces of hardware in addition to ARCNET network boards, hubs, and cable. Components of an ARCNET network include the following:

ARCNET network board

One of these network boards must be inserted into each network station before the station can communicate with other stations on the network.

The Novell RX-Net II (SMC PC120) and Novell RX-Net/2 (SMC PS110) boards supported by NetWare are illustrated in Figure 1.1. Hardware is described on page 3 and illustrated in figure 1.2.

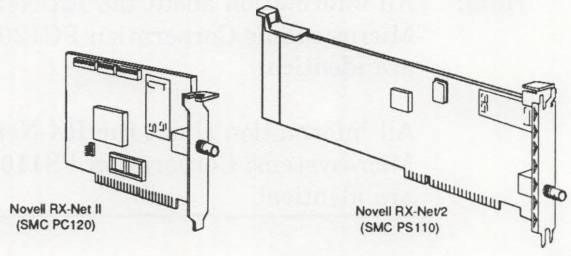


Figure 1.1
Novell RX-Net and SMC ARCNET network boards

Information on the Novell RX-Net II (SMC PC120) boards (including v3.*x* file server settings) is found in Section 2.

Information on the Novell RX-Net/2 and SMC PS110 boards (including v3.*x* file server settings) is found in Section 3.

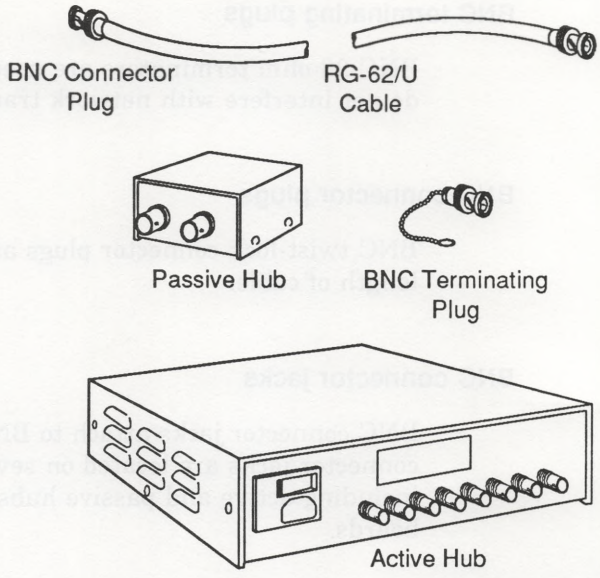


Figure 1.2
ARCNET hardware

Cable

RG-62/U 93-ohm coaxial cable connects network components in ARCNET networks.

Passive hubs

Passive hubs split and relay network signals. They have four ports (standard BNC connectors) to which network cables can be attached. Any unused port on a passive hub must be terminated with a 93-ohm terminator.

Active hubs

Active hubs not only split and relay network messages but also condition and amplify signal strength. They have eight ports. Terminating unused ports on active hubs is recommended but not necessary.

BNC terminating plugs

BNC 93-ohm terminators are used to ensure that line reflections do not interfere with network transmissions.

BNC connector plugs

BNC twist-lock connector plugs are attached to both ends of each length of cable.

BNC connector jacks

BNC connector jacks attach to BNC connector plugs. BNC connector jacks are located on several pieces of hardware including active and passive hubs, active links, and network boards.

Network layout

Network stations using RX-Net boards are laid out in a star topology. The chart below summarizes the maximum distances between components for such a layout. Rules for this network layout follow the chart. As you review the maximum distances and rules, refer to Figure 1.3.

Limitations

Maximum cable distances are given in the following chart:

Cable Distance Limitations

From	To	Distance
One network end	The other end	20,000 feet maximum
Network station	Network station	2,000 feet maximum
Network station	Active hub	2,000 feet maximum
Network station	Passive hub	100 feet maximum
Active hub	Active hub	2,000 feet maximum
Active hub	Passive hub	100 feet maximum
Passive hub	Passive hub	Does not work

Rules

The following rules govern network layout with RX-Net boards:

- Connect active hubs to other active hubs, passive hubs, and network stations.
- Do not connect passive hubs in series. Use passive hubs only as intermediate connections between active hubs and stations. Because passive hubs do not amplify the split signal, the signal is not strong enough for communication.
- Connect workstations, file servers, and routers (bridges) anywhere in the network.

- Do not create loops. A loop is created when a cable coming from an active or passive hub passes through other hubs and then connects back into the original hub.
- Unused ports on a passive hub must be terminated; terminate unused ports on an active hub where possible. Use a 93-ohm terminator.
- If, after installation, you remove a network station from a passive hub, remove the cable also and install a terminator.
- Be careful not to crimp the cable, damage its insulation, or run the cable near heat sources or in heavy traffic areas where hand trucks or rolling chairs might damage it.

Note: Passive hubs split and relay network signals but do not boost the signal's strength. If passive hubs are connected in series, the signal strength becomes too weak for communication.

On a simple two-station network, stations may be up to 2,000 feet apart.

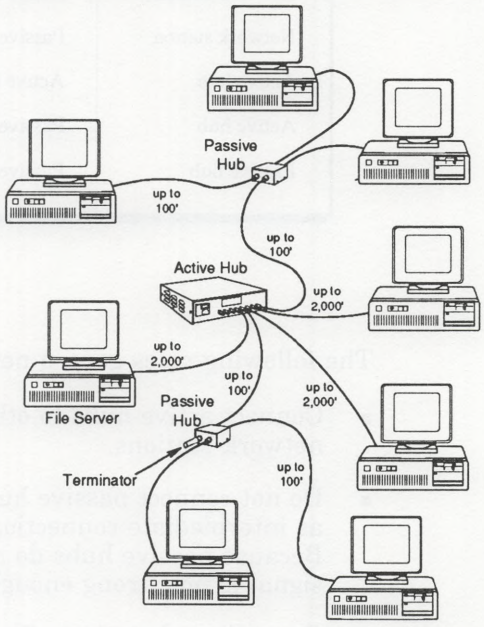


Figure 1.3
Network layout using RX-Net boards

Planning your network layout

Now that you are familiar with ARCNET hardware and understand how it is used on a network, you are ready to plan your own network. As you plan, consider the following questions:

- How large an area must the cabling system cover?
- How many stations (servers, routers, and workstations) are to be connected to the cabling system?
- How far apart are the stations going to be?
- What potential growth in size and number of connections must the system accommodate?
- Which station addresses should be assigned? (See Section 2 for instructions for setting station addresses for RX-Net II boards and Section 3 for RX-Net/2 boards.)

Planning procedure

After careful consideration, complete the following steps:

1. Draw your network plan, labeling each piece of hardware to be included (stations, cables, active and passive hubs, terminators, and so on). Remember the rules given on page 5.
2. Measure the distances between all components and make sure they fall within the maximum allowable specifications.
3. Record these distances on your network plan.
4. Ensure that the locations you choose for file servers have adequate room for any peripherals (printers, external disk drives, and so on) attached.
5. Refer to this network plan when you come to cabling instructions in Section 4.

If you are installing RX-Net II boards in your network stations, continue with Section 2.

If you are installing only RX-Net/2 boards in your network stations, skip to Section 3 on page 25.

Section 2: Configuring RX-Net II network boards

This section explains how to make the following settings for the RX-Net II network boards:

- **Configuration option** (interrupt line, base I/O address, and memory buffer address)
- **Station address**
- **Remote Reset** (if necessary)

Note: Specific settings for Novell RX-Net II network boards used in file servers running NetWare v3.*x* are included in each board's respective section.

All references to routers also refer to bridges.

This section also explains how to install network boards in network stations.

Use the following chart to locate the information you need:

Information	Page
Board configuration guidelines	10
Labeling network boards	10
Configuring Novell RX-Net II (SMC PC120) boards	12

If you are using a COMPAQ model 20E (or other COMPAQ model) using Revision D.1 video controller ROM, do not use base I/O address 2E0h for any RX-Net or SMC network board. Use an option or set of configuration values that do not include this setting. This avoids possible problems or conflicts.

Board configuration guidelines

Use the following guidelines when configuring your boards:

- **Avoid hardware conflicts.**

  The board's settings cannot be used by another device in the machine, such as a graphics adaptor or a modem.

- **Use the numbered configuration options when possible.**

  The numbered options help you identify hardware conflicts and simplify configuring the LAN driver.

- **Use default settings when possible (usually option 0).**

  If you install two network boards in the same network station, each must have a different setting.

If you are using a COMPAQ model 20E (or other COMPAQ model) using Revision D.1 video controller ROM, do not use base I/O address 2E0h for any RX-Net or SMC network board. Use an option or set of configuration values that do not include this setting. This avoids possible problems or conflicts.

- **Use the same configuration option for all workstation network boards of the same type.**

  You can simplify creating boot files and boot diskettes, as long as none of the stations have conflicting settings on other boards.

Labeling network boards

To simplify network setup and administration, record configuration information on a label attached to each network board.

Refer to the diagram of the network layout you were advised to make in Section 1 of this manual and to the worksheets you filled out when you installed the NetWare operating system. (The worksheets are in the main NetWare installation manual.)

Using an adhesive label or some other form of identification, label each network board with the following information:

- **The specific network station** into which the network board is to be inserted (for example, "Terilee's workstation by the main door").
- **The type of station** into which the board will be inserted: workstation, router, file server running NetWare v2.*x*, or file server running NetWare v3.*x*.
- **Remote Reset** (if you plan to enable Remote Reset on a workstation network board).

  The Remote Reset option allows diskless workstations to boot from a network (file server) hard disk.
- **The configuration option** or settings you plan to use for the network board.

  If the network board is to be installed in a server or router, the configuration option must be the one you chose when you generated the NetWare operating system. Network boards installed in the same server or router cannot have the same configuration option number. However, network boards installed in different servers or routers can.

  If the network board is to be installed in a workstation, the configuration option must be the one you chose when you generated the NetWare shell for that particular workstation.
- **The station address.** Each network board must have a unique station address. There are 255 addresses available.

Note: Do not use address 0 (zero) for any network station. This is reserved as a broadcast address.

Use the following procedure to configure your board:

1. **Locate the hardware components on the network board as shown in Figure 2.1.**

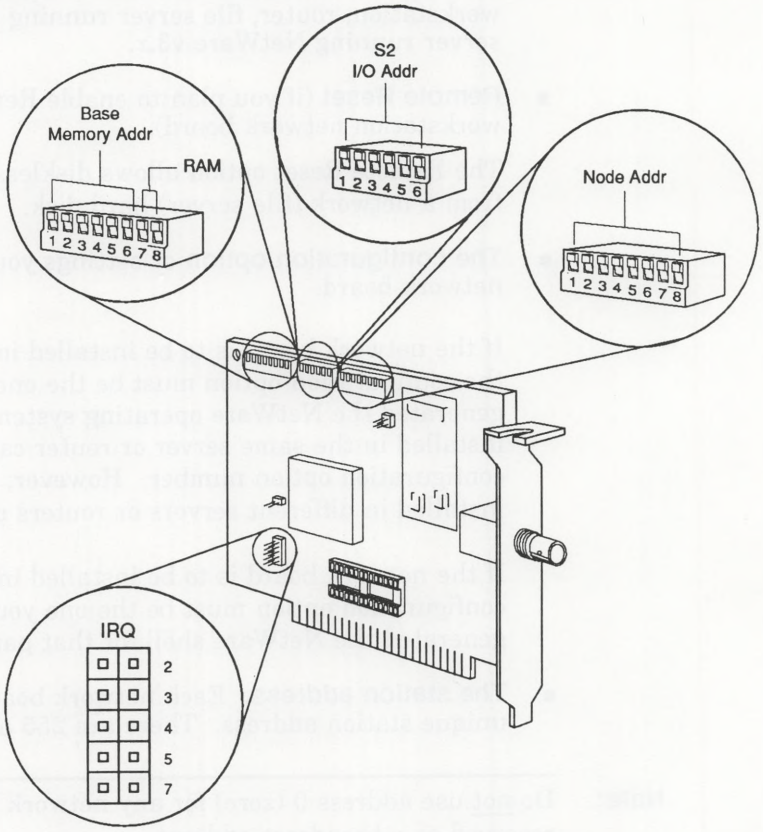


Figure 2.1
Location of configuration option components for RX-Net II (SMC PC120) boards

2. **Set the interrupt line, the memory buffer address, and the base I/O address according to the configuration option you specified on the board's label.**

   Refer to Figure 2.1 for location of switches and jumper blocks. For NetWare 3.*x* file server settings, see figure 2.4.

Config. Option	IRQ Setting	RAM Buffer Address	Base I/O Address
0	IRQ2 (2 3 4 5 7)	OFF 1 2 3 4 5 6 7 8 — D000h	OFF 1 2 3 4 5 6 — 2E0h
1	IRQ3 (2 3 4 5 7)	OFF 1 2 3 4 5 6 7 8 — CC00h	OFF 1 2 3 4 5 6 — 300h
2	IRQ4 (2 3 4 5 7)	OFF 1 2 3 4 5 6 7 8 — DC00h	OFF 1 2 3 4 5 6 — 2F0h
3	IRQ7 (2 3 4 5 7)	OFF 1 2 3 4 5 6 7 8 — C000h	OFF 1 2 3 4 5 6 — 350h

Figure 2.2
Configuration options for RX-Net II (SMC PC120) boards

If you have configuration option conflicts when using the options shown in Figure 2.2 and your driver is JUMPERS configurable (used in a router, dedicated IPX workstation, or v2.*x* file server), use any combination of the supported values shown in Figure 2.3 (one IRQ, one RAM buffer address, and one Base I/O address) to resolve the conflict. If you use values shown in Figure 2.3, you must run the JUMPERS utility to set the LAN driver. For information on using JUMPERS, see the following manuals:

- **For NetWare v2.*x*.** See "JUMPERS" in the "Utilities reference" of *Using the Network*.
- **For NetWare v3.*x*.** See "JUMPERS" in *NetWare v3.11 Utilities Reference*.

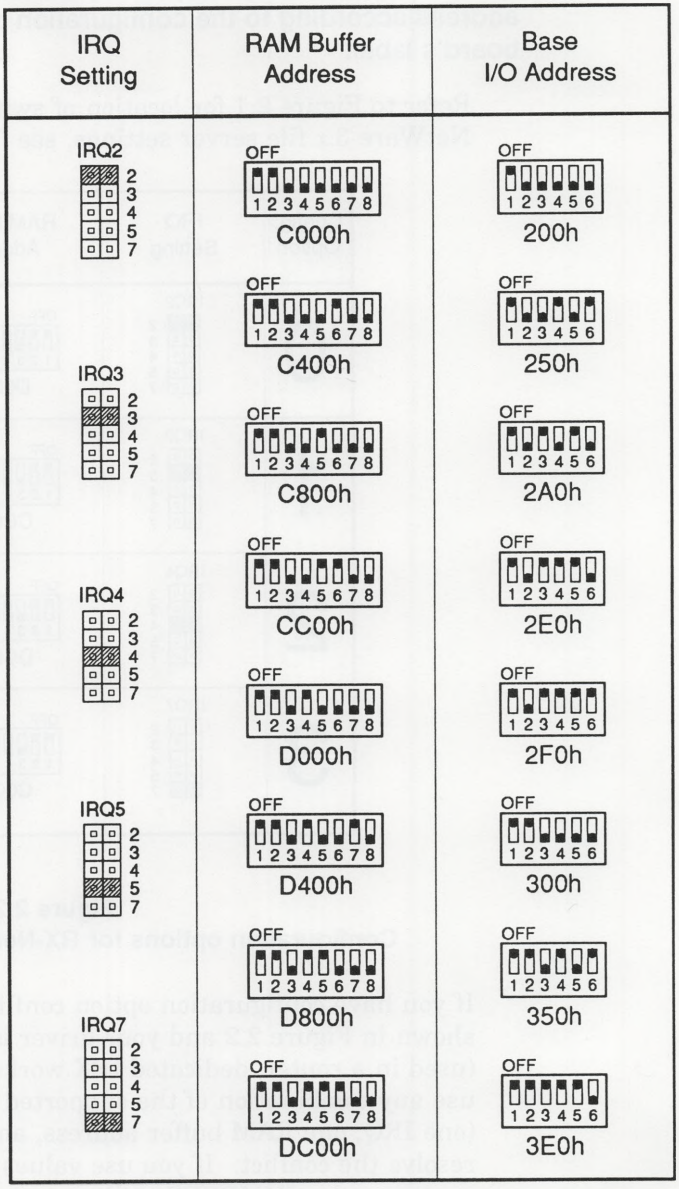


Figure 2.3
Additional supported configuration values for RX-Net II (SMC PC120) boards (also values for DOS ODI and OS/2)

If you are installing an RX-Net II (SMC PC120) board in a Netware v3.*x* file server or are using a DOS ODI or OS/2 driver, select any combination of the configuration values listed in Figure 2.4 (one IRQ, one RAM buffer address, and one Base I/O address).

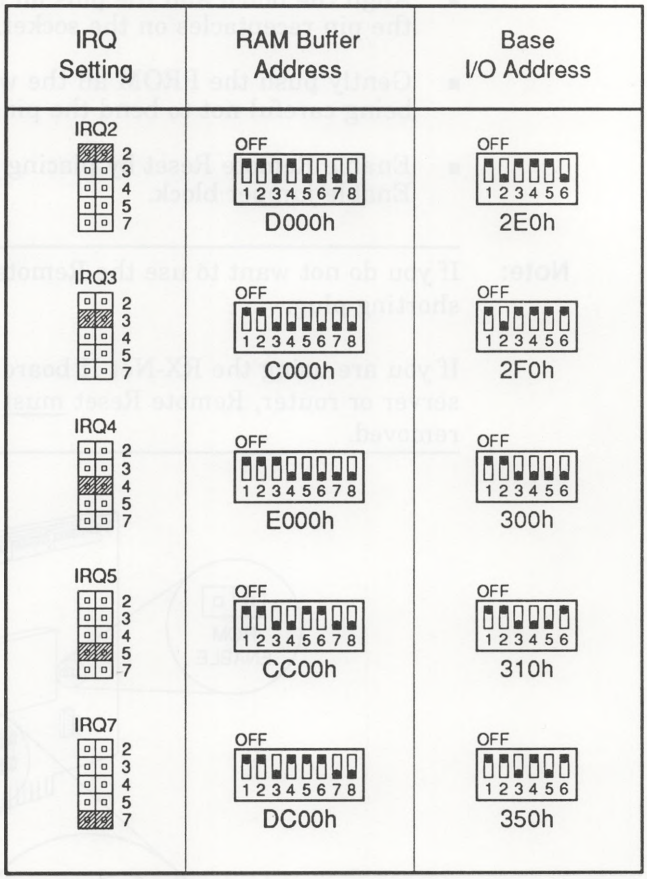


Figure 2.4
Supported configuration values for
RX-Net II (SMC PC120) NetWare v3.*x* file server boards

3. Install the Remote Reset PROM and enable Remote Reset.

See your Novell Authorized Reseller for RX-Net II Remote Boot PROMs (Novell Part #817-000234-020). Refer to Figure 2.5 and use the following guidelines:

- Align the notch and the pins on the PROM with the notch and the pin receptacles on the socket.
- Gently push the PROM all the way down into the socket, being careful not to bend the pins.
- Enable Remote Reset by placing a shorting plug on the ROM Enable jumper block.

Note: If you do not want to use the Remote Reset feature, remove the shorting plug.

If you are using the RX-Net II board in a NetWare v2.*x* or v3.*x* file server or router, Remote Reset must be disabled and the PROM removed.

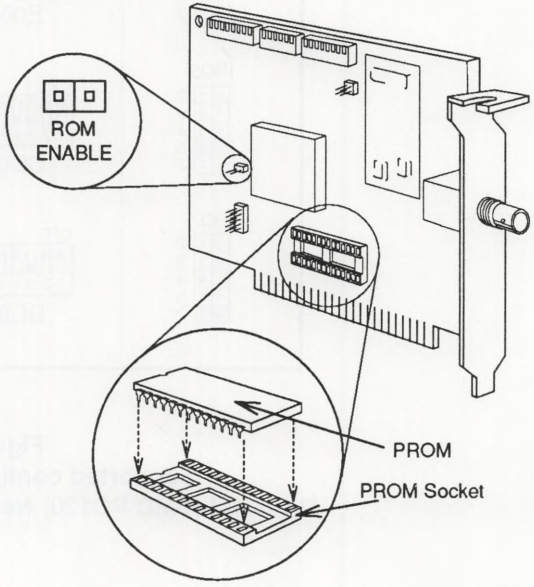


Figure 2.5
Enabling Remote Reset on RX-Net II boards

4. **Set the station address.**

   Refer to Figure 2.1 on page 12 for location of switches; refer to Figure 2.6 on pages 18-24 for station node address settings.

   To organize your network, assign lower-digit addresses to servers and routers and reserve a block of unassigned addresses to allow for expansion.

   For example, to set up a network with one file server and one router, allowing for six more of each in the future, assign station address 1 to your present file server and reserve station addresses 2 through 7 for future servers. Similarly, assign station address 8 to the router and reserve station addresses 9 through 14 for future routers. Start workstation addresses at 15.

   When setting the station address according to the station address chart, observe the following rules:

   - If your board has slide switches, slide each switch to the side where the dark tab is shown.
   - If your board has rocker switches, depress each rocker switch on the side where the dark tab is shown.

Note: Do not use address 0 (zero) for any network station. This is reserved as a broadcast address.

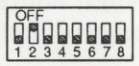
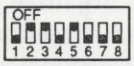
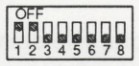
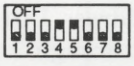
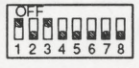
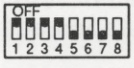
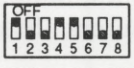
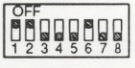
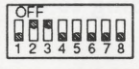
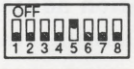
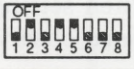
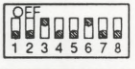
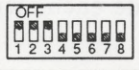
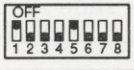
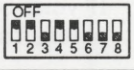
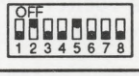
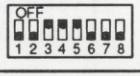
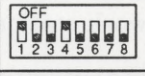
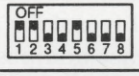
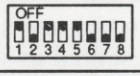
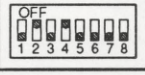
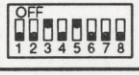
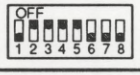
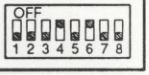
Add.	Switch Block Setting	Add.	Switch Block Setting	Add.	Switch Block Setting	Add.	Switch Block Setting
1 01h		11 0Bh		21 15h		31 1Fh	
2 02h		12 0Ch		22 16h		32 20h	
3 03h		13 0Dh		23 17h		33 21h	
4 04h		14 0Eh		24 18h		34 22h	
5 05h		15 0Fh		25 19h		35 23h	
6 06h		16 10h		26 1Ah		36 24h	
7 07h		17 11h		27 1Bh		37 25h	
8 08h		18 12h		28 1Ch		38 26h	
9 09h		19 13h		29 1Dh		39 27h	
10 0Ah		20 14h		30 1Eh		40 28h	

Figure 2.6
RX-Net II station (node) address settings

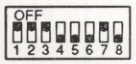
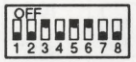
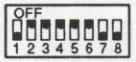
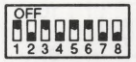
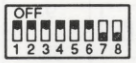
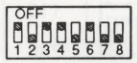
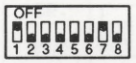
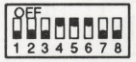
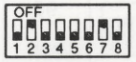
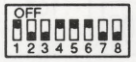
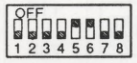
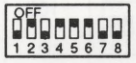
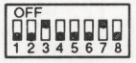
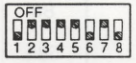
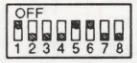
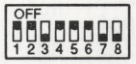
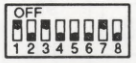
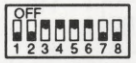
Add.	Switch Block Setting	Add.	Switch Block Setting	Add.	Switch Block Setting	Add.	Switch Block Setting
41 29h		51 33h		61 3Dh		71 47h	
42 2Ah		52 34h		62 3Eh		72 48h	
43 2Bh		53 35h		63 3Fh		73 49h	
44 2Ch		54 36h		64 40h		74 4Ah	
45 2Dh		55 37h		65 41h		75 4Bh	
46 2Eh		56 38h		66 42h		76 4Ch	
47 2Fh		57 39h		67 43h		77 4Dh	
48 30h		58 3Ah		68 44h		78 4Eh	
49 31h		59 3Bh		69 45h		79 4Fh	
50 32h		60 3Ch		70 46h		80 50h	

Figure 2.6 *(continued)*
RX-Net II station (node) address settings

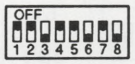
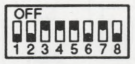
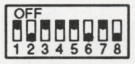
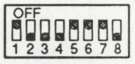
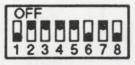
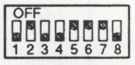
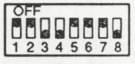
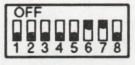
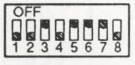
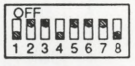
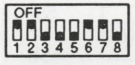
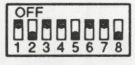
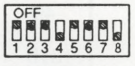
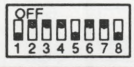
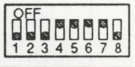
Add.	Switch Block Setting	Add.	Switch Block Setting	Add.	Switch Block Setting	Add.	Switch Block Setting
81 51h		91 5Bh		101 65h		111 6Fh	
82 52h		92 5Ch		102 66h		112 70h	
83 53h		93 5Dh		103 67h		113 71h	
84 54h		94 5Eh		104 68h		114 72h	
85 55h		95 5Fh		105 69h		115 73h	
86 56h		96 60h		106 6Ah		116 74h	
87 57h		97 61h		107 6Bh		117 75h	
88 58h		98 62h		108 6Ch		118 76h	
89 59h		99 63h		109 6Dh		119 77h	
90 5Ah		100 64h		110 6Eh		120 78h	

Figure 2.6 *(continued)*
RX-Net II station (node) address settings

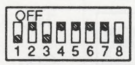
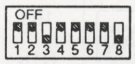
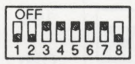
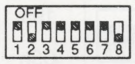
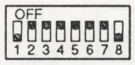
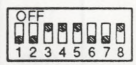
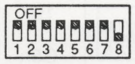
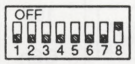
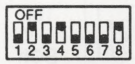
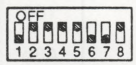
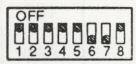
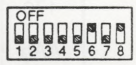
Add.	Switch Block Setting	Add.	Switch Block Setting	Add.	Switch Block Setting	Add.	Switch Block Setting
121 79h		131 83h		141 8Dh		151 97h	
122 7Ah		132 84h		142 8Eh		152 98h	
123 7Bh		133 85h		143 8Fh		153 99h	
124 7Ch		134 86h		144 90h		154 9Ah	
125 7Dh		135 87h		145 91h		155 9Bh	
126 7Eh		136 88h		146 92h		156 9Ch	
127 7Fh		137 89h		147 93h		157 9Dh	
128 80h		138 8Ah		148 94h		158 9Eh	
129 81h		139 8Bh		149 95h		159 9Fh	
130 82h		140 8Ch		150 96h		160 A0h	

Figure 2.6 *(continued)*
RX-Net II station (node) address settings

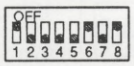
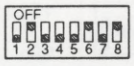
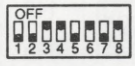
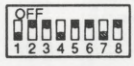
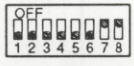
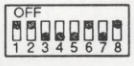
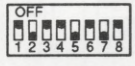
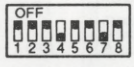
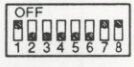
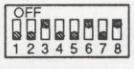
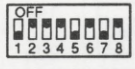
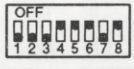
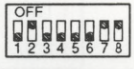
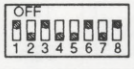
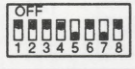
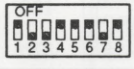
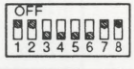
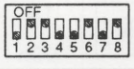
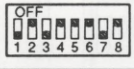
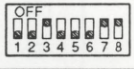
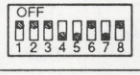
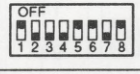
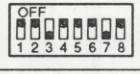
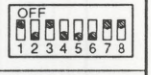
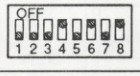
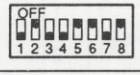
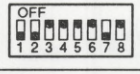
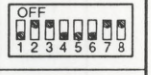
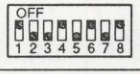
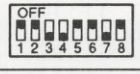
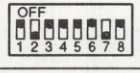
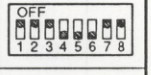
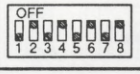
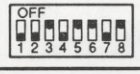
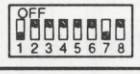
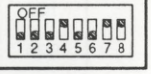
Add.	Switch Block Setting	Add.	Switch Block Setting	Add.	Switch Block Setting	Add.	Switch Block Setting
161 A1h		171 ABh		181 B5h		191 BFh	
162 A2h		172 ACh		182 B6h		192 C0h	
163 A3h		173 ADh		183 B7h		193 C1h	
164 A4h		174 AEh		184 B8h		194 C2h	
165 A5h		175 AFh		185 B9h		195 C3h	
166 A6h		176 B0h		186 BAh		196 C4h	
167 A7h		177 B1h		187 BBh		197 C5h	
168 A8h		178 B2h		188 BCh		198 C6h	
169 A9h		179 B3h		189 BDh		199 C7h	
170 AAh		180 B4h		190 BEh		200 C8h	

Figure 2.6 *(continued)*
RX-Net II station (node) address settings

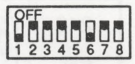
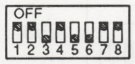
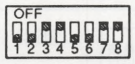
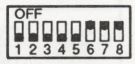
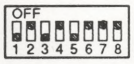
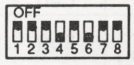
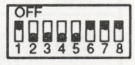
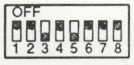
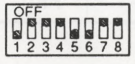
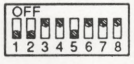
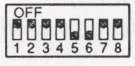
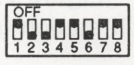
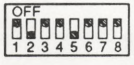
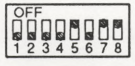
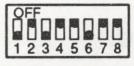
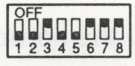
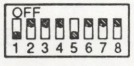
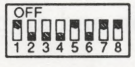
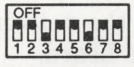
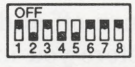
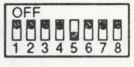
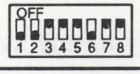
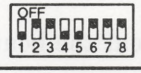
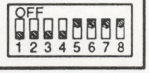
Add.	Switch Block Setting	Add.	Switch Block Setting	Add.	Switch Block Setting	Add.	Switch Block Setting
201 C9h		211 D3h		221 DDh		231 E7h	
202 CAh		212 D4h		222 DEh		232 E8h	
203 CBh		213 D5h		223 DFh		233 E9h	
204 CCh		214 D6h		224 E0h		234 EAh	
205 CDh		215 D7h		225 E1h		235 EBh	
206 CEh		216 D8h		226 E2h		236 ECh	
207 CFh		217 D9h		227 E3h		237 EDh	
208 D0h		218 DAh		228 E4h		238 EEh	
209 D1h		219 DBh		229 E5h		239 EFh	
210 D2h		220 DCh		230 E6h		240 F0h	

Figure 2.6 *(continued)*
RX-Net II station (node) address settings

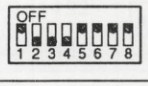
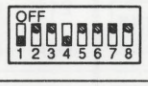
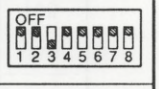
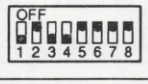
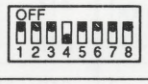
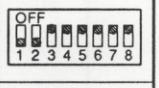
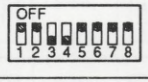
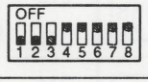
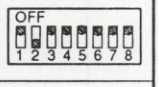
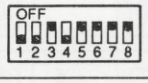
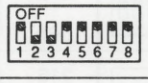
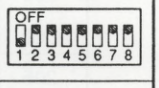
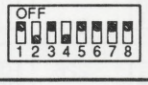
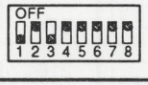
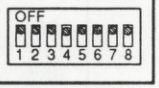
Add.	Switch Block Setting	Add.	Switch Block Setting	Add.	Switch Block Setting
241 F1h		246 F6h		251 FBh	
242 F2h		247 F7h		252 FCh	
243 F3h		248 F8h		253 FDh	
244 F4h		249 F9h		254 FEh	
245 F5h		250 FAh		255 FFh	

Figure 2.6 *(continued)*
RX-Net II station (node) address settings

5. Install the network board.

Turn off and unplug the network station and all peripherals before you install the board.

Seat the board firmly in any available slot.

Where to go from here

After you have configured and installed all of the Novell RX-Net II network boards on your network, continue as follows:

- If you have Novell RX-Net/2 boards to configure, continue with Section 3.
- If you have configured all boards on your network, skip to Section 4 on page 33.

Section 3: Configuring RX-Net/2 network boards

This section explains how to install and make the following settings for RX-Net/2 network boards:

- **Configuration values** (interrupt line, base I/O address, and RAM buffer address)
- **Station address**
- **Network timeout parameter**

Use the following chart to locate the information you need:

Information	Page
Board configuration guidelines	25
Labeling network boards	26
Configuring RX-Net/2 boards	27

Note: Settings for the Novell RX-Net/2 network boards used in file servers running NetWare v3.*x* are the same as those used for the workstation settings.

Board configuration guidelines

Use the following guidelines when configuring your boards:

- **Avoid hardware conflicts.**

  The board setting cannot be used by another device in the machine, such as a graphics adaptor or a modem.

- **Use default settings when possible.**

  If you install two network boards in the same network station, each must have a different combination of configuration values.

- **Use the same configuration combination for all workstation network boards of the same type.**

  You can simplify creating boot files and boot diskettes, as long as none of the stations have conflicting settings on other boards.

Labeling network boards

To simplify network setup and administration, record configuration information on a label attached to each network board.

Refer to the diagram of the network layout you were advised to make in Section 1 of this manual and to the worksheets you filled out when you installed the NetWare operating system. (The worksheets are in the main NetWare installation manual.)

Using an adhesive label or some other form of identification, label each network board with the following information:

- **The specific network station** into which the network board is to be inserted (for example, "Terilee's workstation by the main door").
- **The type of station** into which the network board is to be inserted: workstation, router, file server running NetWare v2.*x*, or file server running NetWare v3.*x*.
- **The configuration combination (file server and router boards only).**

  For RX-Net/2 boards to be installed in file servers or routers, the configuration combination is the one you chose when you generated the NetWare operating system. RX-Net/2 boards installed in the same server or router cannot have the same configuration combination. However, RX-Net/2 boards installed in different servers or routers can.

When you generate NetWare shells for dedicated IPX workstations containing RX-Net/2 boards, you are prompted to select a configuration combination. Because NetWare shells for RX-Net/2 boards are "auto-configuring," you must choose OPTION 4. In dedicated IPX file servers or routers, choose the auto configuring option that matches the slot that your network board is installed in. For DOS ODI and OS/2 drivers, slot key word is used in the NET.CFG file.

- **The station address.** Each network board must have a unique station address. There are 255 addresses available.

Note: Do not use address 0 (zero) for any network station. This is reserved as a broadcast address.

Configuring RX-Net/2 boards

1. **Install the network board.**

Turn off and unplug the workstation and all peripherals before you install the board.

Seat the board firmly in any available slot.

Complete Steps 2 through 10 beginning on the next page to configure Novell RX-Net/2 boards. To complete these steps, you need the following:

- A working copy of the *REFERENCE* (or similarly named) diskette. (If you have not made a working copy of this diskette, do so before continuing with these instructions.)
- The *LAN_DRV_100* option diskette that you received with your RX-Net/2 network board

2. **Copy the option files from the *LAN_DRV_100* option diskette (that came with your board) to the *REFERENCE* diskette.**

   Consult the manual that came with your microchannel architecture system for instructions.

   To change configuration values, follow the manufacturer's instructions or complete Steps 2 through 9.

3. **Run the *REFERENCE* (or similarly named) setup program. Do not automatically configure the system.**

4. **Select the option that allows you to set the board's configuration.**

5. **Select the option that allows you to change the board's configuration.**

6. **Scroll to the slot that corresponds to the inserted board's expansion slot.**

7. **Set the RAM buffer base address, I/O port address range, and interrupt level according to the configuration values you specified on the board's label.**

   - You can use any combination of configuration values that appear when you run the *REFERENCE* (or similarly named) program for workstations, routers, or NetWare v2.*x* or NetWare v3.*x* file servers

Note: The NetWare operating system does not allow duplicate interrupt levels. Choose an interrupt level that does not conflict with the interrupt level of other boards in the station.

Newer IBM PS/2 machines (beginning with model 70 25Mhz 386 or 486) have a "Preempt" setting that defaults to "ENABLED." You must disable "Preempt" using the *REFERENCE* diskette. Failure to do this may result in the system bus hanging.

- If you are setting a file server or router board, the settings on the screen must match the configuration value settings in the operating system or router software. NetWare v3.*x* file servers look for a board in a specified slot. NetWare v2.*x* file servers look in a specific slot only if you choose a self-configuring option. If you do not choose a self-configuring option, the settings made with the *REFERENCE* program must match those selected in the operating system.

- If you are setting a workstation board, choose any combination of settings (except those identified in the following note). If you selected OPTION 4: SELF CONFIGURING when generating the dedicated IPX shell, the shell configures itself to the board settings when you boot the workstation. Slots are used in DOS ODI and OS/2 shell generation.

8. **Set the station address.**

   The RX-Net/2 address consists of the "Node Address High Digit" and the "Node Address Low Digit" settings. Change these settings so that they correspond with the station address you chose when labeling the board by completing the following:

   - Convert the station address from a decimal number (1 through 255) to a hexadecimal number (01h through FFh). Use the conversion chart beginning on page 30 to determine the proper hexadecimal station address.

     The "Node Address High Digit" on the screen represents the left-hand digit of the hexadecimal station address. The "Node Address Low Digit" represents the right-hand digit of the hexadecimal station address.

     For example, if the decimal station address is 12, the hexadecimal station address is 0C. The "Node Address High Digit" is 0 (zero), and the "Node Address Low Digit" is C. If the decimal station address is 50, the hexadecimal station address is 32. The "Node Address High Digit" is 3 and the "Node Address Low Digit" is 2.

Note: Do not use address 0 (zero) for any network station. This is reserved as a broadcast address.

- Scroll to the "Node Address High Digit" setting on the screen, and then use the F5 and F6 keys to scroll through the digits until the correct one is on the screen.
- Repeat this process for the "Node Address Low Digit" setting on the screen. (Changes are saved in a later step.)

Decimal	Hexadecimal	Decimal	Hexadecimal	Decimal	Hexadecimal
		32	20	64	40
1	01	33	21	65	41
2	02	34	22	66	42
3	03	35	23	67	43
4	04	36	24	68	44
5	05	37	25	69	45
6	06	38	26	70	46
7	07	39	27	71	47
8	08	40	28	72	48
9	09	41	29	73	49
10	0A	42	2A	74	4A
11	0B	43	2B	75	4B
12	0C	44	2C	76	4C
13	0D	45	2D	77	4D
14	0E	46	2E	78	4E
15	0F	47	2F	79	4F
16	10	48	30	80	40
17	11	49	31	81	51
18	12	50	32	82	52
19	13	51	33	83	53
20	14	52	34	84	54
21	15	53	35	85	55
22	16	54	36	86	56
23	17	55	37	87	57
24	18	56	38	88	58
25	19	57	39	89	59
26	1A	58	3A	90	5A
27	1B	59	3B	91	5B
28	1C	60	3C	92	5C
29	1D	61	3D	93	5D
30	1E	62	3E	94	5E
31	1F	63	3F	95	5F

Decimal	Hexadecimal	Decimal	Hexadecimal	Decimal	Hexadecimal
96	60	128	80	160	A0
97	61	129	81	161	A1
98	62	130	82	162	A2
99	63	131	83	163	A3
100	64	132	84	164	A4
101	65	133	85	165	A5
102	66	134	86	166	A6
103	67	135	87	167	A7
104	68	136	88	168	A8
105	69	137	89	169	A9
106	6A	138	8A	170	AA
107	6B	139	8B	171	AB
108	6C	140	8C	172	AC
109	6D	141	8D	173	AD
110	6E	142	8E	174	AE
111	6F	143	8F	175	AF
112	70	144	90	176	B0
113	71	145	91	177	B1
114	72	146	92	178	B2
115	73	147	93	179	B3
116	74	148	94	180	B4
117	75	149	95	181	B5
118	76	150	96	182	B6
119	77	151	97	183	B7
120	78	152	98	184	B8
121	79	153	99	185	B9
122	7A	154	9A	186	BA
123	7B	155	9B	187	BB
124	7C	156	9C	188	BC
125	7D	157	9D	189	BD
126	7E	158	9E	190	BE
127	7F	159	9F	191	BF

Decimal	Hexadecimal	Decimal	Hexadecimal	Decimal	Hexadecimal
192	C0	214	D6	236	EC
193	C1	215	D7	237	ED
194	C2	216	D8	238	EE
195	C3	217	D9	239	EF
196	C4	218	DA	240	F0
197	C5	219	DB	241	F1
198	C6	220	DC	242	F2
199	C7	221	DD	243	F3
200	C8	222	DE	244	F4
201	C9	223	DF	245	F5
202	CA	224	D0	246	F6
203	CB	225	E1	247	F7
204	CC	226	E2	248	F8
205	CD	227	E3	249	F9
206	CE	228	E4	250	FA
207	CF	229	E5	251	FB
208	D0	230	E6	252	FC
209	D1	231	E7	253	FD
210	D2	232	E8	254	FE
211	D3	233	E9	255	FF
212	D4	234	EA		
213	D5	235	EB		

9. **Set the network timeout parameter.**

   The network timeout parameter setting for the RX-Net/2 board must be the same for all network stations. (The default is "NORMAL.") If the environment requires something other than the default, scroll to the "Network Timeout Parameter" line and use the F5 and F6 keys to change the setting.

10. **Save the changes and exit from the program.**

Where to go from here

After you have completed hardware and software installation of your boards, continue with Section 4 to cable your network.

Section 4: Cabling your network

After you have set and installed the ARCNET network boards, you are ready to cable your system according to the plan you made in Section 1. Complete the following steps:

1. **Place your network stations (servers, routers (bridges), and workstations) and any peripherals (printers and disk subsystems) according to your network plan.**

2. **Place the hubs where they offer the most efficient use of cable.**

3. **Connect the stations and hubs together.**

   You can use precut cable with BNC plugs already attached, or you can measure and cut your own cable and manually attach BNC plugs.

4. **Terminate all unused ports on active and passive hubs with 93-ohm terminators.**

After you have installed the cables and connected each station to the network cabling, return to your main NetWare manual.

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How to use this manual

This manual explains how to install IBM Token-Ring networking hardware on a NetWare network. It is a supplement to several NetWare installation manuals.

If you haven't already done so, read and follow the instructions in your NetWare installation manual up to the point where it advises you to consult this supplement.

Manual organization

This manual contains four sections and six appendixes.

Section 1: Planning the network

This section introduces the networking hardware you will be using. It also explains how to plan the network.

Section 2: Setting and installing IBM Token-Ring adapters

This section gives instructions for setting and installing the following Token-Ring adapters in ISA and microchannel (MCA) machines used as workstations, routers (bridges), and file servers running NetWare v2.*x* and v3.*x*:

For standard-bus (ISA) stations

- IBM Token-Ring PC Adapter
- IBM Token-Ring 16/4 Adapter
- IBM Token-Ring PC Adapter II

For microchannel architecture stations

- IBM Token-Ring PC Adapter/A
- IBM Token-Ring 16/4 Adapter/A

Section 3: Cabling the network

This section contains instructions for cabling a Token-Ring network.

Section 4: Booting Token-Ring workstations

This section contains special instructions for creating Token-Ring workstation boot diskettes.

Appendix A: Setting up the Remote Reset feature

This appendix contains information about setting up the Remote Reset feature for Token-Ring workstations.

Appendix B: Planning a large nonmovable cabling system

This appendix provides guidelines and references for planning a large nonmovable cabling system that supports up to 260 workstations and 33 8228 units.

Appendix C: The TIMERINT.SYS file

This appendix gives instructions for using the TIMERINT.SYS file for IBM workstations with a BIOS date earlier than June 1985.

Appendix D: Using the source routing driver

This appendix gives instructions on using the source route driver for NetWare communications across IBM Token-Ring Network Bridges.

Appendix E: Configuring the IBM TokenRing 16/4 Busmaster Server Adapter

This appendix gives instructions for configuring, installing, and testing the IBM Token-Ring 16/4 Busmaster Server Adapter. It also explains how to download microcode using the DOWNLOAD command.

Appendix F: Using TRCONFIG to configure NetWare v2.*x* server drivers

This appendix gives instructions for using the TRCONFIG utility to configure NetWare v2.*x* server drivers.

Other Manuals

This manual provides references to IBM Token-Ring manuals and NetWare installation manuals.

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Section 1: Planning the network

In this section, you will

- Identify network hardware
- Learn how each hardware component is used on the network
- Learn the rules and limitations for using the hardware
- Design your network layout and make sure that you have all the hardware you need to set up your network

The hardware described in this section is for a network with a small movable cabling system. This type of cabling is used in networks with up to 96 stations and up to 12 IBM 8228 units.

If your network requires more than 96 stations or more than 12 IBM 8228 units, you must use a large nonmovable cabling system. Refer to the appropriate IBM manuals listed in Appendix B for information on large nonmovable cabling systems.

Note: In this supplement, the term "station" refers to servers, bridges, and workstations. This term is synonymous with the term "attaching device" used in IBM manuals.

IBM Token-Ring network hardware

IBM Token-Ring network hardware components are described below and illustrated in Figure 1.1.

Adapters

Token-Ring adapters are the network interface boards that enable stations to function on a Token-Ring network:

For standard-bus (ISA) stations

- IBM Token-Ring PC Adapter
- IBM Token-Ring 16/4 Adapter
- IBM Token-Ring PC Adapter II

For microchannel architecture stations

- IBM Token-Ring PC Adapter/A
- IBM Token-Ring 16/4 Adapter/A
- IBM Token-Ring 16/4 Busmaster Server Adapter (discussed in Appendix E)

IBM 8228 Multistation Access Units

An IBM 8228 Multistation Access Unit (MAU) is used to connect up to eight stations in a network.

If you are using an IBM 8230 MAU or other third-party unit, see the accompanying documentation.

IBM 8228 Setup Aid

An IBM 8228 Setup Aid is used to test the 8228 unit before it is installed.

IBM Token-Ring network adapter cables

An adapter cable is made of 8 feet of IBM type 6 cable. One end connects to the adapter port of a Token-Ring PC or TRN/A adapter. The other end connects to a patch cable or an IBM 8228 unit.

Patch cables

A patch cable is made of IBM type 6 cable and has a connector at each end. Patch cables can be connected to each other, to adapter cables, or to an IBM 8228 unit.

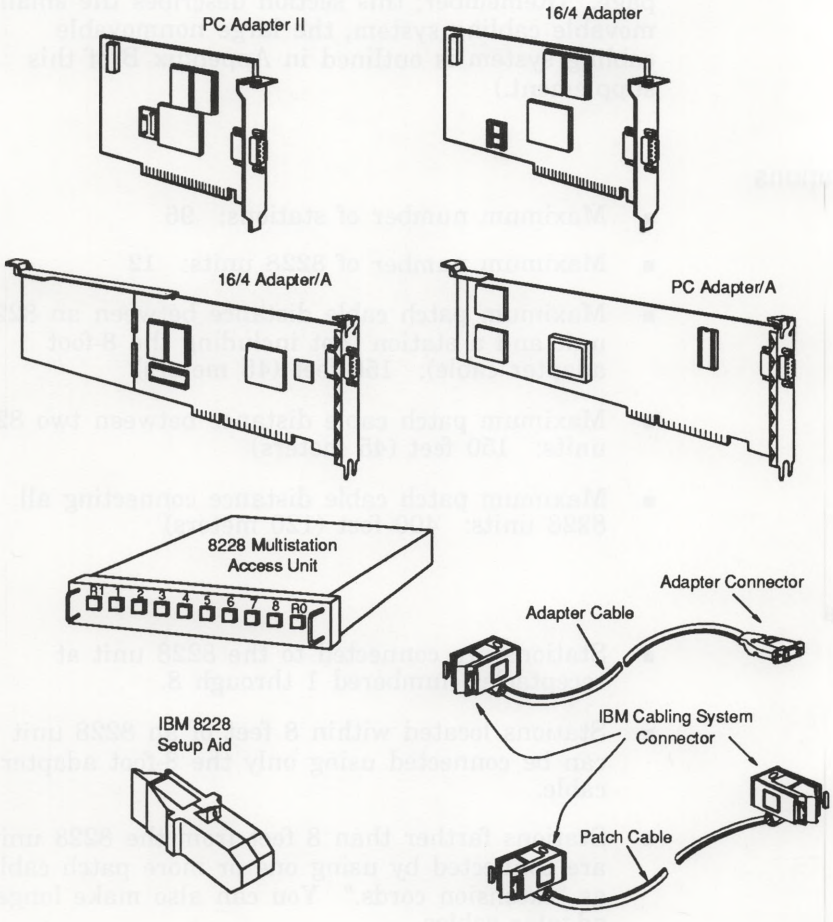


Figure 1.1
IBM Token-Ring network hardware

Token-Ring network layout

Before you consider your specific network needs, review the following summary of the limitations and rules that apply to Token-Ring networks. As you review this summary, refer to Figure 1.2 on the next page. (Remember, this section describes the small movable cabling system; the large nonmovable cabling system is outlined in Appendix B of this supplement.)

Limitations

- Maximum number of stations: 96
- Maximum number of 8228 units: 12
- Maximum patch cable distance between an 8228 unit and a station (not including the 8-foot adapter cable): 150 feet (45 meters)
- Maximum patch cable distance between two 8228 units: 150 feet (45 meters)
- Maximum patch cable distance connecting all 8228 units: 400 feet (120 meters)

Rules

- Stations are connected to the 8228 unit at receptacles numbered 1 through 8.
- Stations located within 8 feet of an 8228 unit can be connected using only the 8-foot adapter cable.
- Stations farther than 8 feet from the 8228 unit are connected by using one or more patch cables as "extension cords." You can also make longer adapter cables.

Rules (continued)

- The 8228 units in a Token-Ring network must be connected in a "ring" using patch cables.

  To form the ring, a patch cable is connected from the RO (Ring Out) receptacle of an 8228 unit to the RI (Ring In) receptacle of the next 8228 unit. This continues until a patch cord has been connected to the RI receptacle of the first 8228 unit. (If a network has only one 8228 unit, its RO and RI receptacles do not need to be connected with a patch cable.)

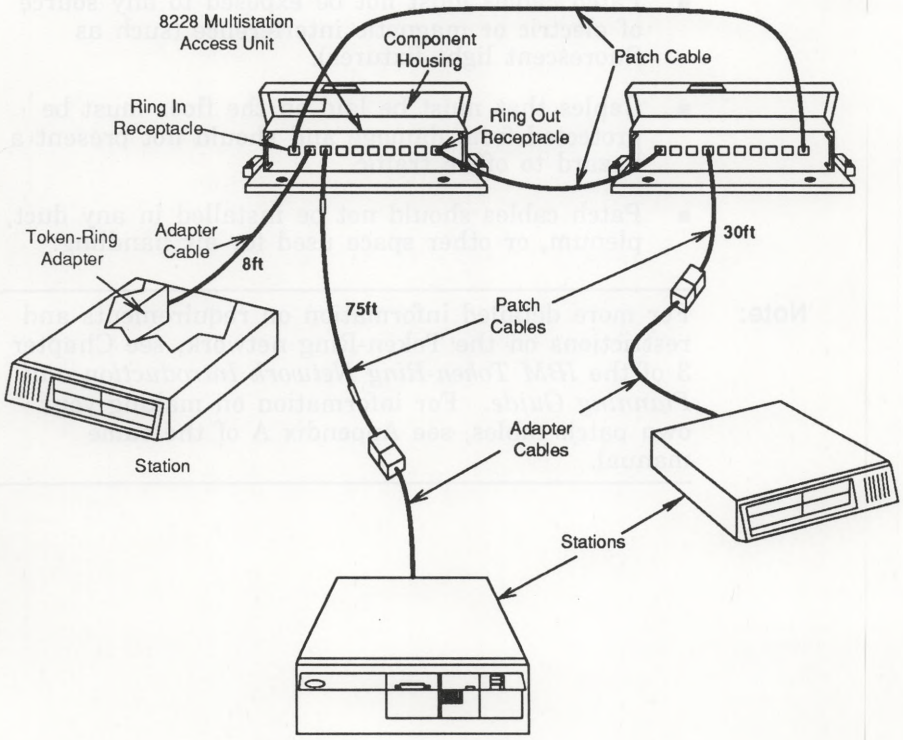


Figure 1.2
IBM Token-Ring network layout

- Patch cables should not be spliced. (However, you may want to make your own patch cables using IBM type 6 cable and connectors.)
- In some areas, there are legal restrictions on the installation of IBM type 6 cable. Make sure that you adhere to any legal restrictions (for example, local building and fire codes) on this type of cable.
- Patch cables must not run outdoors or be exposed to temperatures above 167° F (75° C).
- Patch cables must not be exposed to any source of electric or magnetic interference (such as fluorescent light fixtures).
- Cables that must be laid on the floor must be protected from damage and should not present a hazard to office traffic.
- Patch cables should not be installed in any duct, plenum, or other space used for air handling.

Note: For more detailed information on requirements and restrictions on the Token-Ring network, see Chapter 3 of the *IBM Token-Ring Network Introduction and Planning Guide*. For information on making your own patch cables, see Appendix A of the same manual.

Planning the network layout

Keeping in mind the limitations and rules for Token-Ring networks, define your network needs.

Evaluating your network needs

Consider the following questions:

- How large an area must the cabling system cover?
- How many stations (file servers, bridges, and workstations) will be connected to the cabling system?
- What growth in size and connections must the system accommodate?

Making a diagram of the network plan

Make a diagram showing the network layout:

- Label each piece of hardware—stations, 8228 units, and cables—that will be included.
- Label the type of Token-Ring adapter used in each station.
- Measure the distances between all components and make sure they do not exceed the maximums. Record these distances on the diagram.
- Make sure that the locations you choose for file servers have adequate room for any peripherals (such as printers or external disk drives) that will be attached.

When you have completed this much on the diagram, continue with the next page to plan specific network cabling.

Planning the network cabling

After you make a diagram of the network plan, the next step is to plan your specific network cabling and to make sure that you have all the cables you need.

You need the following materials to plan, identify, and install your cabling:

- An 8228 cabling chart for each IBM 8228 unit in your network. (You can photocopy these from Figure 1.3 of this manual, or you can make your own charts.)
- An 8228 unit label for each IBM 8228 unit on your network. This is simply a label that you can attach to the 8228 unit to identify individual units.
- Ring sequence labels (orange and blue), which are supplied with each 8228 unit.
- A string tag or other label for each Token-Ring adapter in your network. (You must provide these.)
- A label for each patch cable in your network. This can be any label that will adhere to the ends of patch cables.

To plan the specific network cabling, complete the following steps:

1. Assign a unique number to each IBM 8228 unit in your network.

   For example, you might use numbers such as "8228-1," "8228-2," and so on.

   Write each number on an 8228 unit label and attach the label to the appropriate unit.

   Record each unit's number and location in Section 1 of one of the 8228 cabling charts you copied. Also record this number next to the 8228 unit on the diagram you made of your network plan.

8228 Cabling Chart

SECTION 1: Identification

8228 Unit Number _____ Location _____

SECTION 2: Receptacle Connections

8228 Receptacle	1	2	3	4	5	6	7	8
Connect to Station								

SECTION 3: Ring Connections

A. Connect RI of this 8228 to RO of _____

B. Connect RO of this 8228 to RI of _____

Figure 1.3
8228 cabling chart

2. Assign a unique number to each Token-Ring adapter in your network.

   For example, you might use "WS-2" to identify one of your workstations and "Server-1" to identify one of your servers.

Write this number on a string tag, and attach the tag to the adapter. Also record this number next to the station on your diagram of the network plan.

3. In Section 2 of the 8228 cabling chart, record which station adapters will be attached to which receptacles on which IBM 8228 units.

4. In Section 3 of the 8228 cabling chart, record the patch cable connections between your 8228 units. Also record these connections on the ring sequence labels and attach the labels to the 8228 units.

   Remember, if you have more than one 8228 unit, the RO (Ring Out) receptacle of each 8228 unit must be connected with a patch cable to the RI (Ring In) receptacle of another 8228 unit. Otherwise, network performance will be degraded.

5. Attach labels to the ends of each patch cable in your network, identifying which connection the cable is used for. (As you attach labels, make sure you have all the cables you need for your network layout.)

   For example, one patch cable might be connecting the RO receptacle of your "8228-1" unit to the RI receptacle of your "8228-2" unit. Another patch cable might be connecting the adapter cable of "WS-2" to receptacle 4 of the "8228-1" unit.

Note: As mentioned, an IBM 8228 Setup Aid is shipped with each IBM 8228 unit. We suggest that you use the Setup Aid to test your 8228 unit at this time. Instructions for testing the 8228 units are included with the Setup Aid.

Section 2: Setting and installing IBM Token-Ring adapters

This section contains information on setting and installing IBM Token-Ring adapters. Use this section to set adapters for workstations, servers, and routers (bridges).

For instructions on setting and installing adapters in network stations, find the adapter type you plan to use in the list below and skip to the page indicated.

Adapter Type	Page
IBM Token-Ring PC Adapter	12
IBM Token-Ring PC Adapter II	15
IBM Token-Ring 16/4 Adapter	18
IBM Token-Ring PC Adapter/A	27
IBM Token-Ring 16/4 Adapter/A	28

Setting the IBM Token-Ring PC Adapter

The IBM Token-Ring PC Adapter is a full length 8-bit ISA network adapter. Use Figures 2.1 and 2.2 to make the following settings on the adapter:

- **Interrupt**

  Select an interrupt that does not conflict with settings for other devices in the machine. Figure 2.1 on page 13 shows how to set the interrupt.

- **Primary/alternate**

  Designate each Token-Ring adapter as a primary or alternate adapter. (The primary setting uses base I/O addresses 0A20-0A23; the alternate setting uses base I/O addresses 0A24-0A27.)

  You can use a maximum of two Token-Ring adapters in a machine. One adapter must be designated as primary and the other adapter as alternate. IBM suggests that the sole adapter in a machine use the primary address.

  Figure 2.1 on page 13 shows how to set the adapter as primary or alternate.

- **ROM address**

  Select a ROM address that does not conflict with ROM addresses required by other devices in the machine nor with the RAM address required by the same adapter. Recommended ROM addresses are shown in Figure 2.2 on page 14.

Note: Push switches up for the ON position and down for the OFF position.

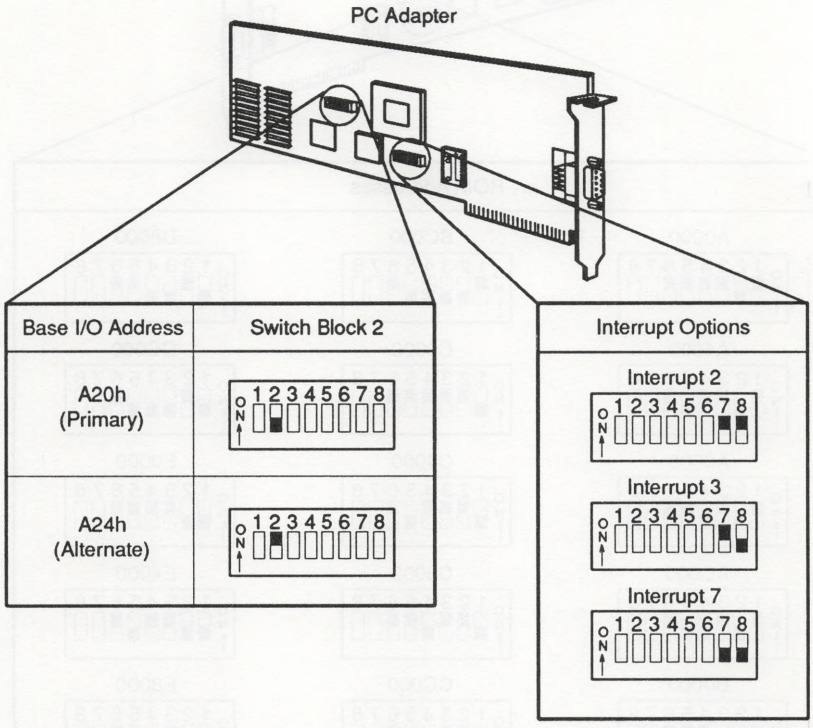


Figure 2.1
IBM Token-Ring PC Adapter settings

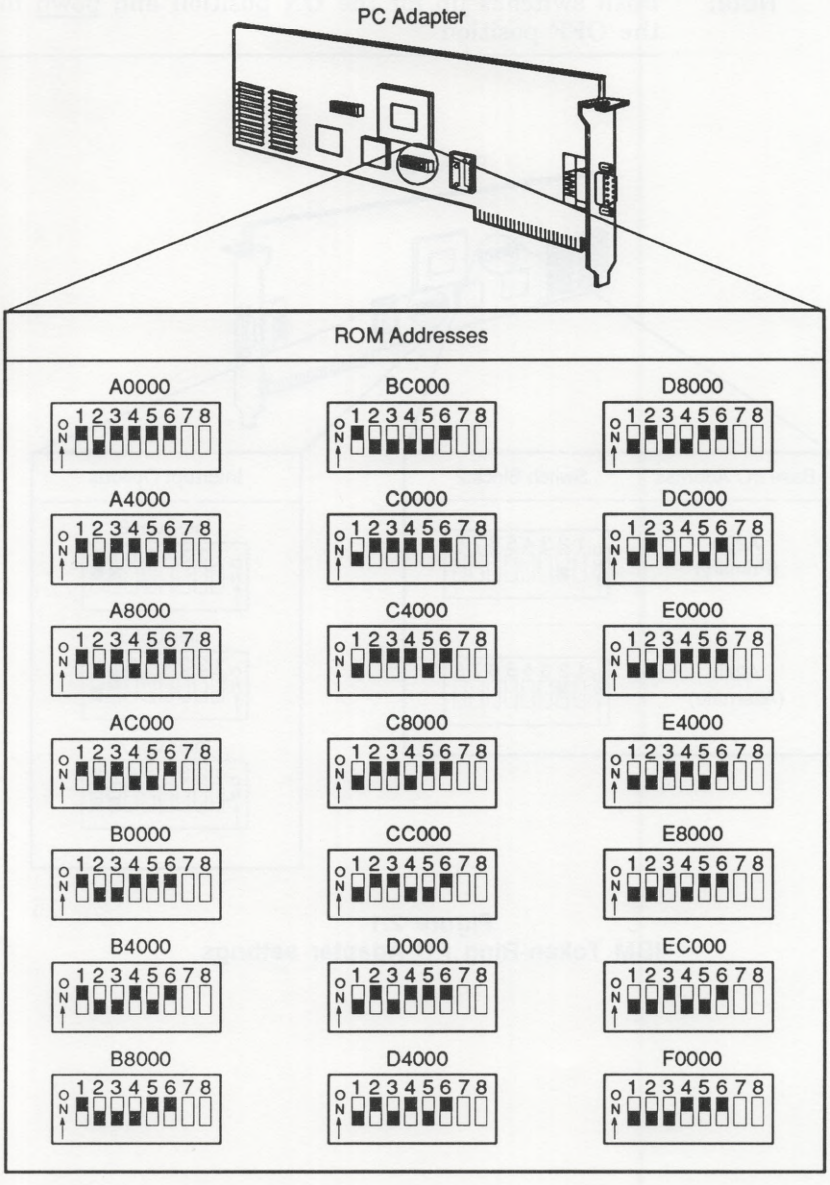


Figure 2.2
IBM Token-Ring PC Adapter ROM addresses

Setting the IBM Token-Ring PC Adapter II

The IBM Token-Ring PC Adapter II is a half-length 8-bit ISA network adapter. Use Figures 2.3 and 2.4 to make the following settings on the adapter:

- **Interrupt**

  Select an interrupt that does not conflict with settings for other devices in the machine. Figure 2.3 on page 16 shows how to set the interrupt.

- **Primary/alternate**

  Designate each Token-Ring adapter as a primary or alternate adapter. (The primary setting uses base I/O addresses 0A20-0A23; the alternate setting uses base I/O addresses 0A24-0A27.)

  You can use a maximum of two Token-Ring adapters in a machine. One adapter must be designated as primary and the other adapter as alternate. IBM suggests that the sole adapter in a machine use the primary address.

  Figure 2.3 on page 16 shows how to set the adapter as primary or alternate.

- **Shared RAM**

  Specify 16KB of RAM to be shared by the adapter and the host. Although the adapter can be set to use other sizes of shared RAM, when 16KB is specified (for adapters that allow 16KB or more of shared RAM) the driver pages the adapter's memory to use the extra memory on the adapter. If other settings are used, performance is adversely affected.

  Figure 2.3 on page 16 shows how to set shared RAM.

- **ROM address**

  Select a ROM address that does not conflict with ROM addresses required by other devices in the machine nor with the RAM address required by the same adapter. Recommended ROM addresses are shown in Figure 2.4 on page 17.

Note: Push switches down for the ON position and up for the OFF position.

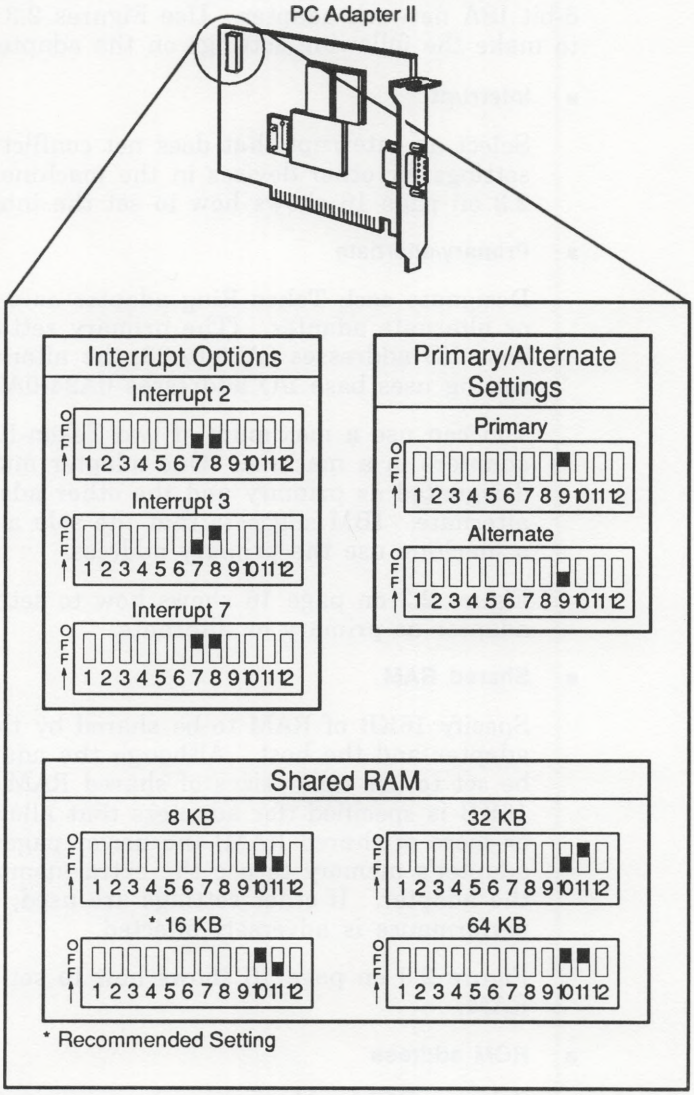


Figure 2.3
IBM Token-Ring PC Adapter II settings

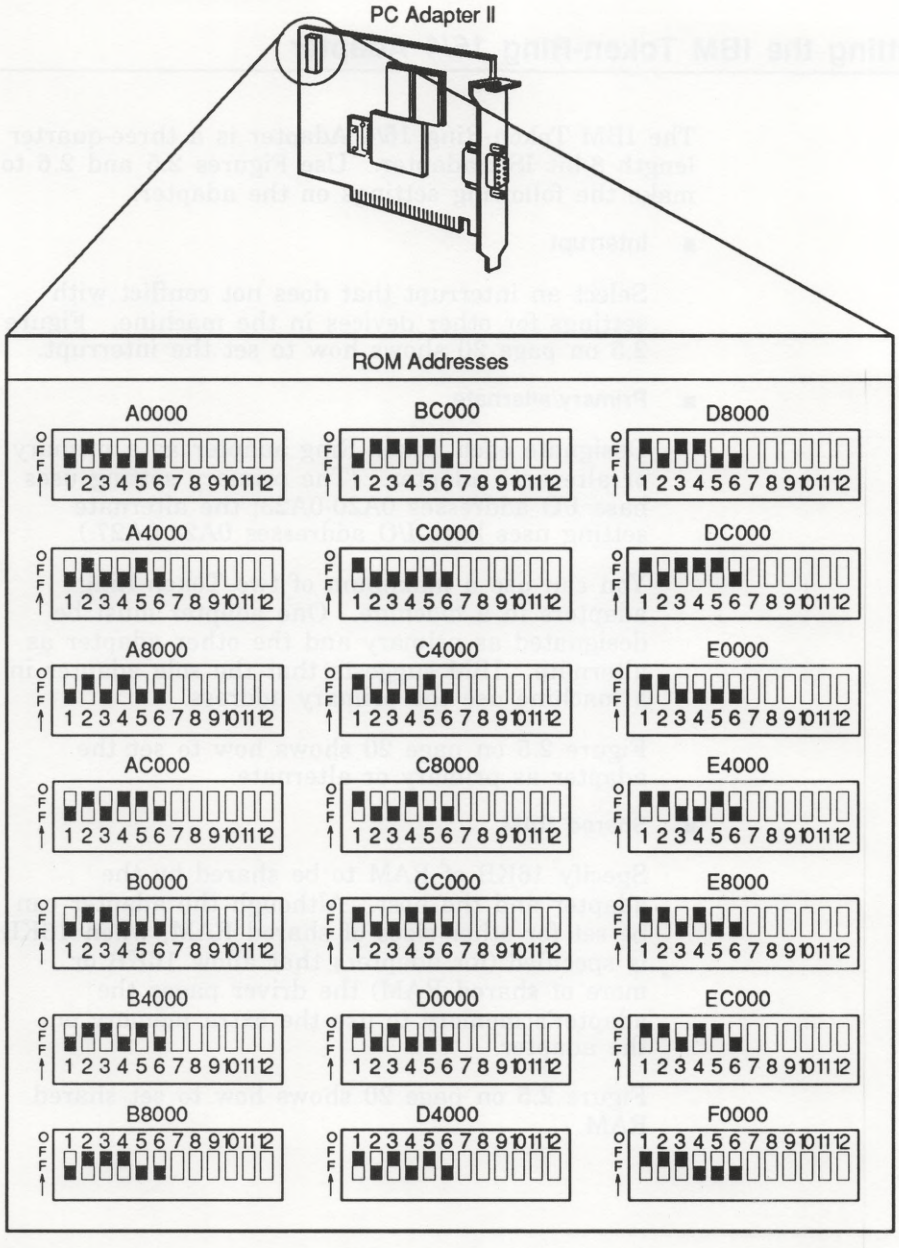


Figure 2.4
IBM Token-Ring PC Adapter II ROM addresses

Setting the IBM Token-Ring 16/4 Adapter

The IBM Token-Ring 16/4 Adapter is a three-quarter length 8-bit ISA adapter. Use Figures 2.5 and 2.6 to make the following settings on the adapter:

- **Interrupt**

  Select an interrupt that does not conflict with settings for other devices in the machine. Figure 2.5 on page 20 shows how to set the interrupt.

- **Primary/alternate**

  Designate each Token-Ring adapter as a primary or alternate adapter. (The primary setting uses base I/O addresses 0A20-0A23; the alternate setting uses base I/O addresses 0A24-0A27.)

  You can use a maximum of two Token-Ring adapters in a machine. One adapter must be designated as primary and the other adapter as alternate. IBM suggests that the sole adapter in a machine use the primary address.

  Figure 2.5 on page 20 shows how to set the adapter as primary or alternate.

- **Shared RAM**

  Specify 16KB of RAM to be shared by the adapter and the host. Although the adapter can be set for other sizes of shared RAM, when 16KB is specified (for adapters that allow 16KB or more of shared RAM) the driver pages the adapter's memory to use the extra memory on the adapter.

  Figure 2.5 on page 20 shows how to set shared RAM.

- **Data rate**

  Select the appropriate data rate, 16Mbps or 4Mbps. Figure 2.5 on page 20 shows how to set the data rate switch.

You must set all IBM Token-Ring 16/4 Adapters on each physical ring to use the same data rate (either 16Mbps or 4Mbps). Failure to do so will cause network errors. However, NetWare allows bridging between a network using a16Mbps and a network using 4Mbps data rates.

- **ROM address**

  Select a ROM address that does not conflict with ROM addresses required by other devices in the machine or with the RAM address required by the same adapter. Recommended ROM addresses are shown in Figure 2.6 on page 21.

Note: Push switches down for the ON position and up for the OFF position.

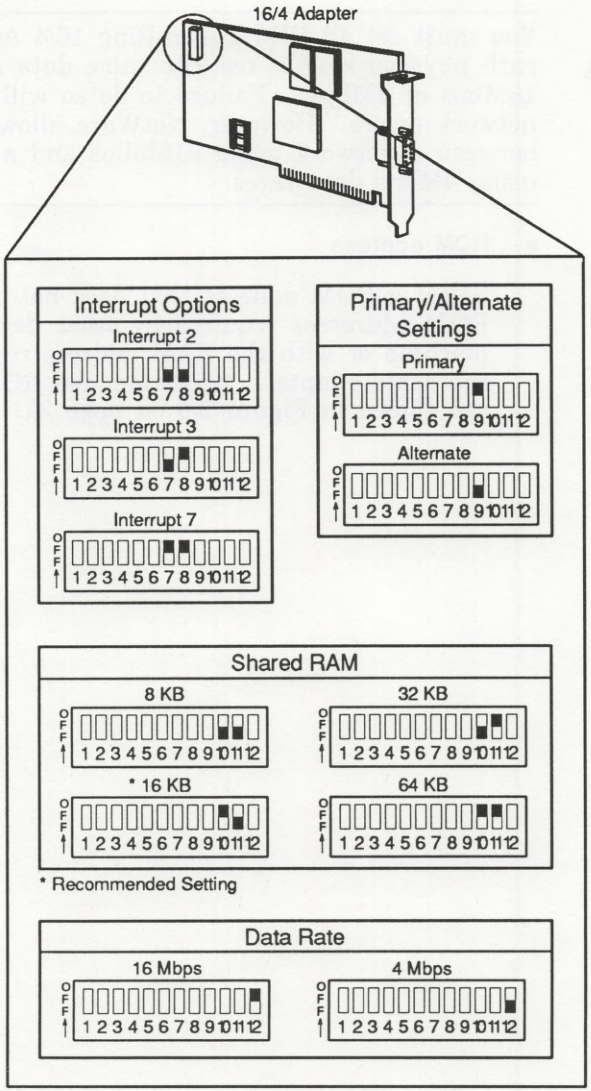


Figure 2.5
IBM Token-Ring 16/4 Adapter settings

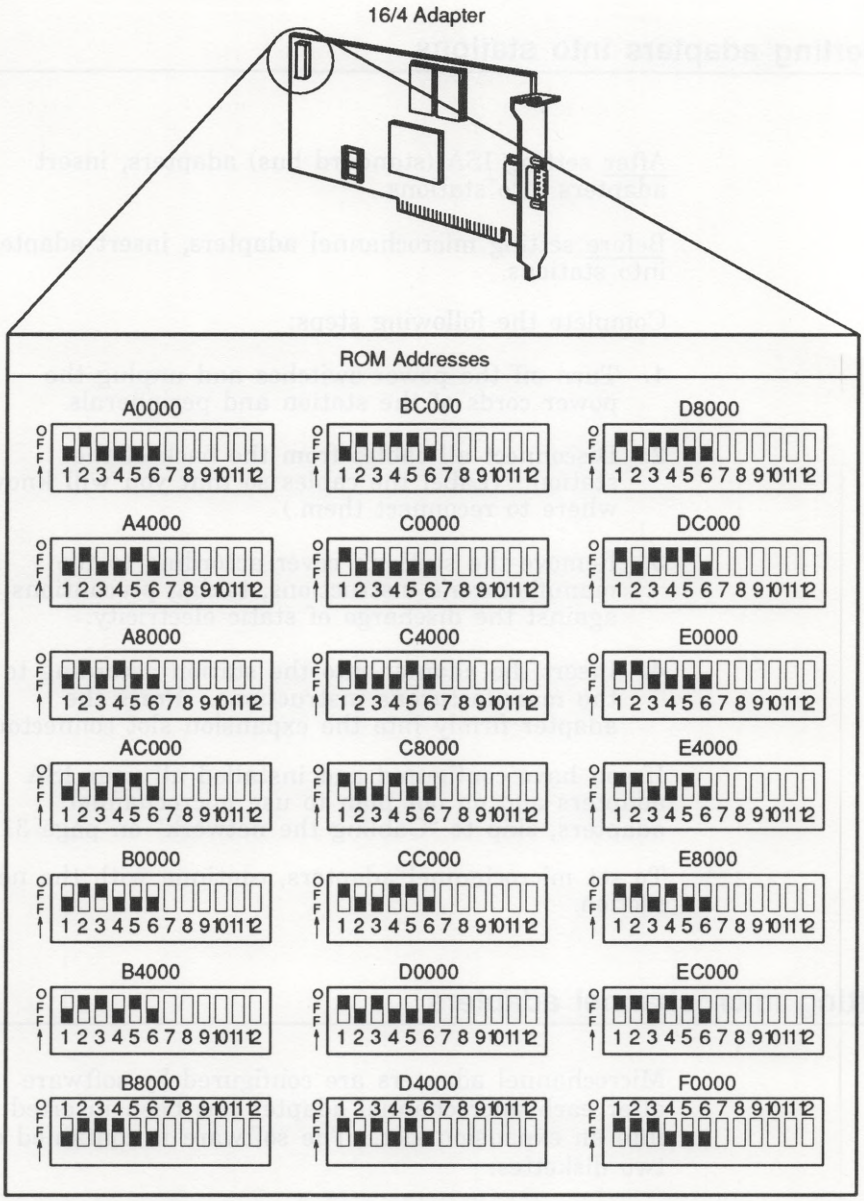


Figure 2.6
IBM Token-Ring 16/4 Adapter ROM addresses

Inserting adapters into stations

After setting ISA (standard bus) adapters, insert adapters into stations.

Before setting microchannel adapters, insert adapters into stations.

Complete the following steps:

1. Turn off the power switches and unplug the power cords of the station and peripherals.
2. Disconnect all cables from the back of the station. (Label the cables so that you will know where to reconnect them.)
3. Remove the station's cover according to the manufacturer's instructions, taking precautions against the discharge of static electricity.
4. Insert the adapter into the station according to the manufacturer's instructions. Press the adapter firmly into the expansion slot connector.

If you have configured and installed all your ISA adapters and do not plan to use microchannel adapters, skip to "Cabling the network" on page 31.

To set microchannel adapters, continue with the next section.

Setting microchannel adapters

Microchannel adapters are configured by software after each microchannel adapter has been inserted into an expansion slot. The software is contained on two diskettes:

- The *REFERENCE* diskette that accompanied the microchannel machine contains a setup program.
- The *OPTION* diskette that came with the adapter contains the .ADF file with the supported settings for the adapter.

To prepare the working copy of the *REFERENCE* diskette, complete the following steps (if you have already made a working copy, skip to Step 2):

1. Make a working copy of the *REFERENCE* diskette by following the instructions in the documentation that accompanied the machine.

Note: If you have previously added or removed a network interface board, you may see a heading and a message similar to the following:

```
Adapter Configuration Error - 00165  Page 1 of 2

(Help information about error 00165)

Automatically configure the system? (Y/N)
```

You can also see one or two pages of help information. You can press the PageDown key to view any additional screens.

Answer "No" to the prompt.

---

2. If the appropriate .ADF file is not on the original *REFERENCE* diskette, copy the *TRN/A OPTION* diskette to the working copy of the *REFERENCE* diskette.

Note: Do not use the DOS COPY command to copy the *OPTION* diskette to the *REFERENCE* diskette; select "Copy an option diskette" from the main menu of the REFERENCE program.

For instructions, refer to the documentation that came with your microchannel machine.

Run the REFERENCE program to set microchannel adapters.

- For IBM Token-Ring PC Adapter/A, see page 27 for settings.
- For IBM Token-Ring 16/4 Adapter/A, see page 28 for settings.

Complete the following steps at each station to set its configuration:

1. Insert the working copy of the *REFERENCE* diskette into drive A.

2. Boot the station by turning it on or, if the station is already on, press the Control, Alt, and Delete keys at the same time. A screen with a logo will appear, and a prompt similar to the following appears in the lower left-hand corner.

   ```
   Press Enter (<--|) to continue:
   ```

   Press <Enter>.

3. Since you have just installed an adapter, you will probably see a message similar to the following.

   ```
   Adapter Configuration Error - 00165      Page 1 of 2

   (Help information about error 00165 )

   Automatically configure the system? (Y/N)
   ```

   You will see one or two pages of help information. Press the PageDown key to view any additional screens.

   If you want to set the adapter automatically. Answer "Yes" to the prompt. Select "View Configuration" and scroll to the appropriate slot. Record the settings. Then skip to Step 8.

Note: If you select automatic configuration for 16/4 Adapter/A, it will default to 4Mbps (even if you have previously set it manually to 16Mbps).

If you want to set each value. Answer "No" to the prompt. Continue with Step 4.

4. From the main menu, select "Set Configuration".

5. Select "Change Configuration".

   A screen similar to the following appears. Use the Up- and Down-arrow keys to scroll through the entire screen.

```
Change configuration

Total System Memory
  Installed Memory ..................... 1024 KB (1.0 MB)
  Usable Memory ........................ 1024 KB (1.0 MB)

Built In Features
  Installed Memory ..................... 1024 KB (1.0 MB)
  Diskette Drive A Type ................ [1.44MB 3.5"     ]
  Diskette Drive B Type ................ [Not Installed   ]
  Math Coprocessor ..................... Not Installed
  Serial Port .......................... [SERIAL_1]
  Parallel Port ........................ [PARALLEL_1]

Slot1 - PC Network Adapter
  Type, Memory Location, Interrupt Level   [Primary, Mem2, Int3]

Slot2 - IBM Token-Ring Network Adapter/A
  Primary or Alternate adapter ......... [Primary]
  ROM Address range .................... [CC000 - CDFFF]
  RAM Address range .................... [D8000 - DBFFF]
  Interrupt Level ...................... [Interrupt 2]

Slot3 - Empty

Slot4 - IBM Fixed Disk Adapter
  Type of first drive .................. [  31]
  Type of second drive ................. [   0]
  Arbitration Level .................... [Level_3  ]

Esc=Quit   F5=Previous   F10=Save   ↑ Home
F1=Help    F6=Next                 ↓ Down  PageDown
```

6. Locate the slot that contains the Token-Ring microchannel adapter and scroll to it. The resources are listed and configuration data that can be changed are shown in brackets.

7. Use any settings that do not conflict with other hardware settings. Consult the help screens for the optimum setting for each resource.

   Options marked with an asterisk are in conflict with some other assignment within the machine.

   - For information on recommended settings for IBM Token-Ring PC Adapter/A, see page 27.
   - For information on recommended settings for IBM Token-Ring 16/4 Adapter/A, see page 28.

   If the settings shown are incorrect, highlight the incorrect information (using the Up- and Down-arrow keys). Use the F5 and F6 function keys to scroll through the available settings.

8. When the settings shown on the "Change Configuration" or "View Configuration" screen are correct, record them on the appropriate worksheet.

9. Exit the screen by pressing <Escape>.

   Press the F10 function key to save the changes and press <Esc> to exit the screen.

10. The "Main Menu" appears. Press <Escape> to exit the REFERENCE program.

If you have additional microchannel adapters to set, repeat these steps at each station with a microchannel adapter installed.

When you have finished setting all the adapters, continue with "Cabling the network" on page 31.

Setting the IBM Token-Ring PC Adapter/A

The IBM Token-Ring PC Adapter/A is a 16-bit microchannel adapter. After inserting the adapter into an expansion slot, run the REFERENCE program (instructions are on page 22 through 26).

Make the following settings:

- **Shared RAM**

  Specify 16KB of RAM to be shared by the adapter and the host. Although the adapter can be set to use other sizes of shared RAM, when 16KB is specified (for adapters that allow 16KB or more of shared RAM) the driver pages the adapter's memory to use the extra memory on the adapter.

- **Primary/alternate**

  Designate each Token-Ring adapter as a primary or alternate adapter. (The primary setting uses base I/O addresses 0A20-0A23; the alternate setting uses base I/O addresses 0A24-0A27.)

  You can use a maximum of two Token-Ring adapters in a machine. One adapter must be designated as primary and the other adapter as alternate. IBM suggests that the sole adapter in a machine use the primary address.

- **ROM address**

  Select a ROM address that does not conflict with ROM addresses required by other devices in the machine or with the RAM address required by the same adapter.

For information on optimum settings, refer to the help screens in the REFERENCE program.

If you configure the adapter automatically, view the configuration afterwards so you can record the RAM address range and interrupt level.

Setting the IBM Token-Ring 16/4 Adapter/A

The IBM Token-Ring 16/4 Adapter/A is a 16-bit microchannel adapter. After inserting the adapter into an expansion slot, run the REFERENCE program (instructions are pages 22 through 26).

Make the following settings:

- **Shared RAM**

  Specify 16KB of RAM to be shared by the adapter and the host. Although the adapter can be set to use other sizes of shared RAM, when 16KB is specified (for adapters that allow 16KB or more of shared RAM) the driver pages the adapter's memory to use the extra memory on the adapter.

- **Data rate**

  Select the data rate, 16Mbps or 4Mbps.

  If you select automatic configuration in the REFERENCE program, the data rate will default to 4Mbps.

You must set all IBM Token-Ring 16/4 Adapters on each physical ring to use the same data rate (either 16Mbps or 4Mbps). Failure to do so will cause network errors. However, NetWare allows bridging between a network using a16Mbps and a network using 4Mbps data rates.

- **Primary/alternate**

  Designate each Token-Ring adapter as a primary or alternate adapter. (The primary setting uses base I/O addresses 0A20-0A23; the alternate setting uses base I/O addresses 0A24-0A27.)

  You can use a maximum of two Token-Ring adapters in a machine. One adapter must be designated as primary and the other adapter as alternate. IBM suggests that the sole adapter in a machine use the primary address.

- **ROM address**

  Select a ROM address that does not conflict with ROM addresses required by other devices in the machine nor with the RAM address required by the same adapter.

For information on optimum settings, refer to the help screens in the REFERENCE program.

If you configure the adapter automatically, view the configuration afterwards so you can record the RAM address range and interrupt level.

Notes

Section 3: Cabling the network

After you have identified the network hardware components (Section 1) and set and installed Token-Ring network adapters in each station (Section 2), you are ready to cable the network. This section explains a few simple practices to observe when you connect your network stations.

Note: This section, like Section 1, describes the networking hardware and layout for a network with a small movable cabling system. This type of cabling is used for networks with up to 96 stations and up to 12 IBM 8228 units.

If your network uses a large nonmovable cabling system (for up to 260 stations or more than 33 IBM 8228 units), you should cable your network according to the instructions in the IBM manuals.

To cable the network, complete the following steps:

1. Place all network stations and other components in the locations you have chosen for them.
2. Run the appropriate lengths and types of cables between network stations and the IBM 8228 units. (Section 1 defines the types of cabling.)
3. Before connecting cables to the 8228 ports, plug in the Setup Aid to verify that a connection exists for each port that will be used.

4. Connect all stations and IBM 8228 units with network cables.

   Adapter cables are connected to stations using the Token-Ring adapter ports, as shown in Figure 3.1 below.

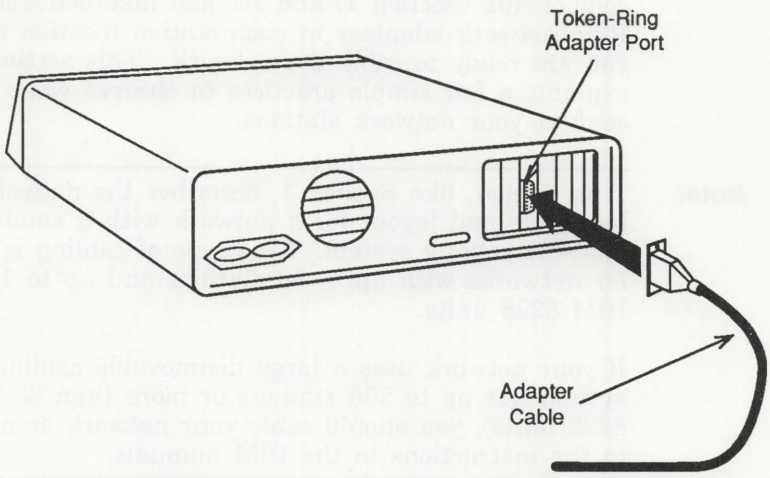


Figure 3.1
Connecting adapter cables to Token-Ring adapter ports

Where to go from here

When you have cabled the network, continue with Section 4 to prepare the workstations for booting.

Section 4: Booting Token-Ring workstations

This section explains how to prepare IBM Token-Ring workstations for booting. Workstations can be booted from any of the following:

- Boot files on a floppy diskette
- Boot image files on the file server (for workstations using the Remote Reset feature)
- Boot files on a local hard disk

To use the first two methods, you must create boot diskettes. To use the third method, you should substitute the local hard disk for the boot diskette in the instructions. Keep in mind that many references to boot diskettes also apply to local hard disks that contain the workstation boot files.

The instructions in this section replace those under the heading "Create the Workstation Boot Diskette" in the "DOS Workstation Installation" section of *NetWare v3.11 Installation* and "Managing DOS Workstations" in NetWare v2.2 *Using the Network*.

Note: Although the instructions are similar, Token-Ring workstation boot diskettes require additional preparation steps which are explained in this section.

If you are using DOS ODI workstations, refer to *NetWare ODI Shell for DOS* and "Managing DOS Workstations" in NetWare v2.2 *Using the Network* for more information on making boot diskettes for DOS ODI workstations and on the DOS ODI LANSUP.COM Token-Ring driver.

Follow the steps in the chart on the next page to make boot diskettes for Token-Ring workstations. You may want to use the chart as a checklist. Refer to the listed pages for additional information.

Page	Essential Steps	Additional Steps
36	Gather needed materials.	
38	Understand files involved.	
43	Format boot diskettes with DOS.	
43	Will workstation use LAN SUPPORT PROGRAM? yes / no	Place LAN SUPPORT PROGRAM diskette in drive A: Type **DXMAID** <Enter>
48	Copy shell files. Are you using NetWare's NetBIOS emulator? yes / no	Copy NETBIOS.COM and INT2F.COM to boot diskette.
50	Is workstation other than IBM or 100% compatible? yes / no	Type **COPY CON SHELL.CFG** <Enter> at DOS prompt to create SHELL.CFG file and set machine type.
51	Will workstation use AUTOEXEC.BAT file? yes / no	Type **COPY CON AUTOEXEC.BAT** <Enter> at DOS prompt to create AUTOEXEC.BAT file.
53	Will workstation use Remote Reset? yes / no	See Appendix A: Setting up the Remote Reset feature.
53	Boot workstations.	

Preparing to create boot diskettes

Before you create the boot diskettes for your Token-Ring network, you must do the following:

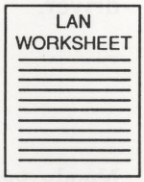
- Locate the "NetWare File Server LAN Worksheet" and certain resource diskettes that contain files needed for the boot diskettes
- Understand the basic function of various files found on Token-Ring boot diskettes

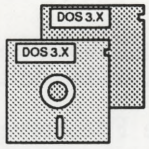
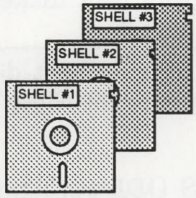
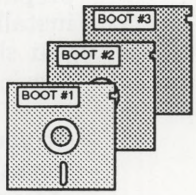
Note: The instructions for making boot diskettes for DOS ODI workstations differ from those for DOS workstations.

If you are using DOS ODI workstations refer to *NetWare ODI Shell for DOS* or "Managing DOS Workstations" in NetWare v2.2 *Using the Network* for more information on making boot diskettes.

Assembling needed materials

You should locate the following materials before preparing boot diskettes.

Item	Contents
	"NetWare File Server LAN Worksheet" which you should have prepared for file server installation or which you should receive from the installer. (If you do not have the worksheet, make a list of your workstations by number or name. List the DOS version each workstation will be using.)

Item	Contents
	DOS files for each version of DOS to be used on the network.
	NetWare shell files for each workstation. (The main NetWare installation manual contains instructions for creating them.)
	IBM Token-Ring files (contained on the *LAN SUPPORT PROGRAM* diskette). Use these files if you are using the SLANSUP.OBJ or the LANSUP.COM Token-Ring driver.
	Newly system-formatted, blank diskettes for each workstation. Label each diskette with the name or number of its respective workstation.

An overview of boot files

Each workstation on your network must have access to certain files in order to boot. You must create a boot diskette for each workstation on your network that will boot from a floppy disk or a Remote Reset boot file. Workstations that boot from a local hard disk must have the same files on the local hard disk.

The following files are required for each workstation:

Filename	Source
DOS system files	Created when the diskette is formatted. Must be DOS 3.*x* or above.
NET3.COM or NET4.COM	NetWare shell files stored in WSGEN.
DXMA0MOD.SYS DXMC0MOD.SYS CONFIG.SYS	IBM Token-Ring files from the *LAN SUPPORT PROGRAM* diskette.
IPX.COM	Created with WSGEN and linked to the driver.

Note: If you are using the SLANSUP.OBJ or the DOS ODI LANSUP.COM Token-Ring driver, you will need to use the files on the *LAN SUPPORT PROGRAM* diskette.

If you are using the STOKEN.OBJ or DOS ODI TOKEN.COM Token-Ring driver, you do not need to use the *LAN SUPPORT PROGRAM*.

You may also need to include the following files.

Filename	Source
NETBIOS.EXE INT2F.COM	Novell's NETBIOS emulator programs found on the shell diskettes. A more detailed explanation of these files is given in the next section.
DXMT0MOD.SYS	IBM's NETBIOS emulator program found on the *LAN SUPPORT PROGRAM* diskette. This file is required if you are using the SLANSUP.OBJ or the LANSUP.COM Token-Ring driver. More detail about this file is given in the next section.
SHELL.CFG or NET.CFG	You may need to create one of these files if you are using workstations that are not IBM or 100% compatible. (If you do not want to create a SHELL.CFG file, any options usually specified in a SHELL.CFG file can be specified in a NET.CFG file.)
NET.CFG	You need to create this file for DOS ODI workstations if you are using Novell's LAN Workplace or a third-party protocol or if you have changed the adapter's configuration without using the REFERENCE program. (DOS ODI workstations do not require this file when you use factory-set default options.)
AUTOEXEC.BAT	This file will load the shell files and change to the first network drive automatically.

NetBIOS emulator files

Some application programs require the use of a NetBIOS emulator program that allows workstations to run applications written for IBM-type networks.

Two NetBIOS emulator programs are available—one from Novell and one from IBM. They cannot be used simultaneously in a workstation.

Filename	Explanation
NETBIOS.EXE INT2F.COM	Novell's NetBIOS emulator programs. These files are found on the shell diskettes. Use these files if either of the following applies: ■ You plan to run an application program requiring Novell's NetBIOS emulator program. ■ You plan to use a nondedicated NetWare file server or bridge. (If you will be using an IBM Token-Ring network, you will need to use the source routing driver. For instructions, refer to Appendix D of this supplement.) For instructions on copying these files, refer to "Copying the shell files" on page 47.

Filename	Explanation
DXMT0MOD.SYS	IBM NetBIOS emulator program. The file is found on the *LAN SUPPORT PROGRAM* diskette. This file is copied when you use the IBM NetBIOS emulator program while running the DXMAID program. (See "Copying the LAN SUPPORT PROGRAM files" on page 42.) Use this program if your application programs require IBM's NetBIOS emulator program.

Note: If you are using the SLANSUP.OBJ or the DOS ODI LANSUP.COM Token-Ring driver, you will need to use the files on the *LAN SUPPORT PROGRAM* diskette.

If you are using the STOKEN.OBJ or DOS ODI TOKEN.COM Token-Ring driver, you do not need to use the *LAN SUPPORT PROGRAM*.

Creating Token-Ring workstation boot diskettes

Figure 4.1 below illustrates the steps involved in creating Token-Ring boot diskettes. If you need more information about one of the steps, refer to the page listed below the command instructions.

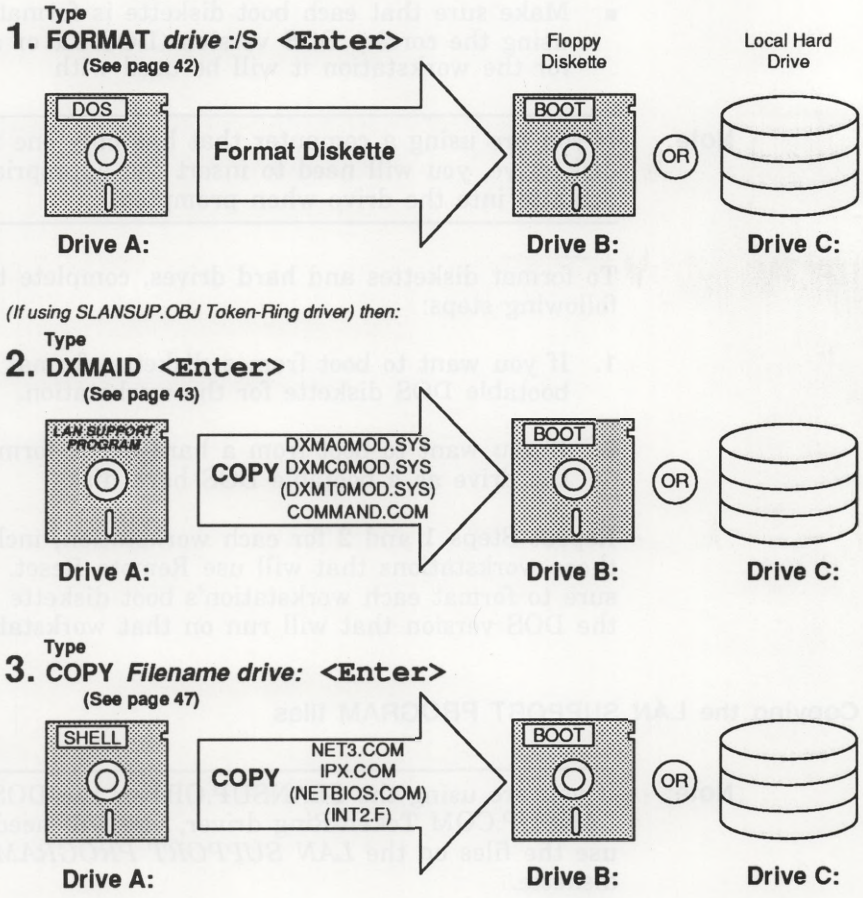


Figure 4.1
Copying basic boot diskette files

Formatting with DOS

To create workstation boot diskettes, you will need to

- Use a personal computer that has at least one floppy disk drive (preferably two) or a hard drive
- Use the DOS FORMAT command, including the /S parameter
- Make sure that each boot diskette is formatted using the correct DOS version (DOS 3.*x* or above) for the workstation it will be used with

---

Note: If you are using a computer that has only one floppy disk drive, you will need to insert the appropriate diskette into the drive when prompted.

To format diskettes and hard drives, complete the following steps:

1. If you want to boot from a diskette, format a bootable DOS diskette for the workstation.
2. If you want to boot from a hard drive, format the drive as a bootable DOS hard disk.

Repeat Steps 1 and 2 for each workstation, including those workstations that will use Remote Reset. Be sure to format each workstation's boot diskette using the DOS version that will run on that workstation.

Copying the LAN SUPPORT PROGRAM files

Note: If you are using the SLANSUP.OBJ or the DOS ODI LANSUP.COM Token-Ring driver, you will need to use the files on the *LAN SUPPORT PROGRAM* diskette.

If you are using the STOKEN.OBJ or the DOS ODI TOKEN.COM Token-Ring driver, you do not need to use the *LAN SUPPORT PROGRAM*.

Use the DXMAID program found on the *LAN SUPPORT PROGRAM* diskette to copy the following files onto the formatted boot diskette or hard disk:

DXMA0MOD.SYS
DXMC0MOD.SYS
CONFIG.SYS
DXMT0MOD.SYS (optional--IBM's NetBIOS emulator program)

To use the DXMAID program, complete the following steps:

1. Switch to drive A, place the *LAN SUPPORT PROGRAM* diskette in drive A, and type

   DXMAID <Enter>

Note: Please read all the information that appears on the screen as you go through the DXMAID program, to make sure that you are running the program correctly. If you have questions, use the F1 key for help.

---

2. As you run the DXMAID program, you must respond to several prompts. The first prompt appears similar to the following:

   Will this copy of the program be used in THIS computer? (Y/N) [Y]

   Answer "Yes" to this prompt.

3. The following prompt appears:

   Will the 3270 Workstation Program be used? (Y/N) [N]

   Answer "No" to this prompt.

4. You then see the following prompt:

   ```
   Will programs that need the NETBIOS interface be
   used? (Y/N) [Y]
   ```

   If you will be using IBM's NetBIOS emulator program (DXMT0MOD.SYS), answer "Yes."

   Otherwise, answer "No."

Note: If you plan to have the workstation boot by Remote Reset, answer "No" to the above prompt. IBM's NetBIOS emulator program does not work with the Remote Reset PROM.

---

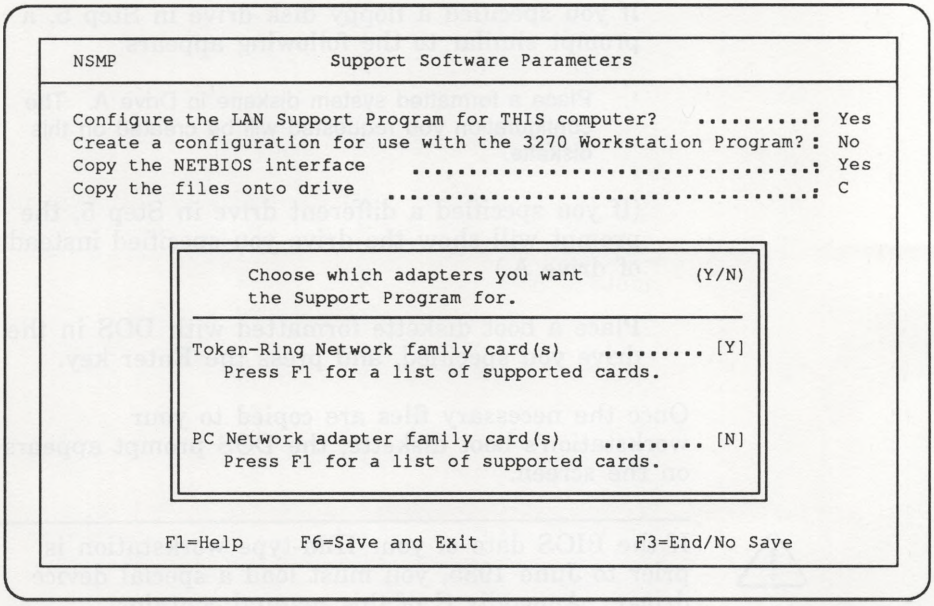
5. You then see the following prompt:

   ```
   What drive do you want the Support Program copied
   onto? (A, B, C, . . .) [ ]
   ```

   If the workstation will boot from a floppy diskette or by Remote Reset, specify drive A by typing "A" and pressing the Enter key.

   If the workstation will boot from a hard disk, type the drive letter of the hard disk (usually C), and press the Enter key.

6. A screen similar to the following appears, listing your responses to the four prompts.


NSMP
Support Software Parameters
Configure the LAN Support Program for THIS computer? .....: Yes
Create a configuration for use with the 3270 Workstation Program? : No
Copy the NETBIOS interface .....: Yes
Copy the files onto drive .....: C
Choose which adapters you want (Y/N)
the Support Program for.
Token-Ring Network family card(s) ..... [Y]
Press F1 for a list of supported cards.
PC Network adapter family card(s) ..... [N]
Press F1 for a list of supported cards.
F1=Help
F6=Save and Exit
F3=End/No Save

7. You must specify which IBM adapter you have installed in the workstation. Answer "Yes" to the prompt for the Token-Ring network family cards.

8. If you have answered all the prompts as you wanted, confirm your choices by pressing the F6 key to save and exit.

   If you want to change your responses, press the F3 key to end the program without saving the configuration. Then return to Step 2 on page 43 and answer the prompts again.

9. If you specified a hard disk in Step 5, the configuration you specified will be copied to the disk.

   If you specified a floppy disk drive in Step 5, a prompt similar to the following appears:

   > Place a formatted system diskette in Drive A. The configuration you requested will be created on this diskette.

   (If you specified a different drive in Step 5, the prompt will show the drive you specified instead of drive A.)

   Place a boot diskette formatted with DOS in the drive you specified, and press the Enter key.

Once the necessary files are copied to your workstation's boot diskette, the DOS prompt appears on the screen.

If the BIOS date of your IBM-type workstation is prior to June 1985, you must load a special device driver. Appendix C of this manual contains instructions for loading this driver (and for determining the BIOS date).

Repeat Steps 1 through 9, beginning on page 43, for each workstation in your network. Then continue with the following instructions.

Copying the shell files

After you have formatted the boot diskette or hard drive for each workstation, you must copy files onto each diskette or hard disk:

1. Insert the appropriate workstation shell diskette into drive A.

2. If you plan to copy files to a boot diskette, insert the newly formatted boot diskette into drive B if you have two drives. If you have only one floppy disk drive, insert the boot diskette and follow the instructions given at the prompts.

   If copying files to a hard disk, enter the appropriate drive letter (usually C) when prompted.

3. Copy the IPX.COM file and either the NET3.COM or NET4.COM file from the workstation shell diskette to the floppy diskette or hard disk.

   If you are using NetWare's NetBIOS emulator programs, you should also copy NETBIOS.EXE and INT2F.COM.

   For DOS ODI workstations, refer to *NetWare ODI Shell for DOS* and "Managing DOS Workstations" in NetWare v2.2 *Using the Network* for information on required files.

4. Repeat Steps 2 and 3 until all needed files have been copied.

The following files should be on your diskette or drive (again, for DOS ODI workstations, refer *NetWare ODI Shell for DOS* and "Managing DOS Workstations" in NetWare v2.2 *Using the Network* for a list of required files):

COMMAND.COM (automatically copied when the disk is system formatted)

DXMA0MOD.SYS (optional--LAN SUPPORT PROGRAM)

DXMC0MOD.SYS (optional--LAN SUPPORT PROGRAM)

CONFIG.SYS (optional--LAN SUPPORT PROGRAM)

NET3.COM or NET4.COM

IPX.COM

DXMT0MOD.SYS (optional--IBM's NetBIOS emulator program)

NETBIOS.COM (optional--Novell's NetBIOS emulator program)

INT2F.COM (used with Novell's NetBIOS.COM)

Repeat Steps 1 through 4 for each workstation on your Token-Ring network.

Copying source routing files

If you are using IBM Token-Ring Source Routing with a NetWare v3.*x* file server, you must copy the ROUTE.COM file to your boot diskette.

Copy the ROUTE.COM file from the *DOS/DOS ODI* diskette to your boot diskette or hard disk.

Note: For more information on ROUTE.COM parameters and Source Routing, see Appendix D of this supplement. Refer to the *NetWare v3.11 System Administration* manual for information on ROUTE.NLM.

Copying optional files

In addition to the files you have just copied, you may need to include one or both of the following files.

SHELL.CFG	Shell configuration file if you are using non-IBM workstations.
NET.CFG	You need to create this file for DOS ODI workstations if you are using Novell's LAN Workplace or a third-party protocol or if you have changed the adapter's configuration without using the REFERENCE program. (DOS ODI workstations do not require this file if you are using factory-set default options.)
AUTOEXEC.BAT	This file will load the shell files and change to the first network drive automatically.

The following sections explain when each file should be used.

Shell configuration files

The NetWare shell must be able to tell what workstation type is requesting DOS files. If you are using non-IBM brand workstations or workstations that are not 100% compatible, you can configure the shell by specifying the long machine type of the workstation in the SHELL.CFG file. The long machine type is the six-letter name you assign to each non-IBM brand of workstation when you create machine-specific DOS directories (as explained in the "Network Setup" section of *NetWare v3.11 Installation* or in "Directory Structure" in NetWare v2.2 *Concepts*).

Note: There are several options for configuring the NetWare shell by setting internal variables and counters through the SHELL.CFG file. However, this section deals only with the Long Machine Type option. For a complete list of options, see Appendix B in *NetWare v3.11 Installation* or "Managing DOS workstations" in NetWare v2.2 *Using the Network*.

The default long machine type is "IBM_PC." If you are using only IBM PC-type workstations, you do not need to create a SHELL.CFG file to change the long machine type. In that case, skip to "Creating AUTOEXEC.BAT files" on the following page.

If you are using other machine types, complete the following steps for each workstation that is not an IBM PC type.

1. Insert a workstation boot diskette into drive A.
2. Type

```
COPY CON SHELL.CFG  <Enter>
LONG MACHINE TYPE = machine  <Enter>
^Z  <Enter>
```

Replace *machine* with the six-letter name you have assigned to the machine type. If you want to set other options (as mentioned above), include them in the file as you create it.

NET.CFG file

The NET.CFG file is a control file that contains section headings and options that deviate from the established defaults of the regular workstation boot process for DOS ODI drivers. (If you have not changed the default hardware settings on the network adapter, you do not need a NET.CFG file.)

You need a NET.CFG file if you are using Novell's LAN Workplace or a third party protocol or if you have changed hardware configuration options without using the microchannel REFERENCE program.

Note: Any options from the SHELL.CFG file can be specified in the NET.CFG file. However, if a SHELL.CFG file exists and you place SHELL.CFG options in the NET.CFG file, they will be ignored.

For more information on creating a NET.CFG file, see *NetWare ODI Shell for DOS* and "Managing DOS Workstations" in NetWare v2.2 *Using the Network*.

Creating AUTOEXEC.BAT files

In addition to the NetWare shell files, you may find it useful to add AUTOEXEC.BAT files to workstation boot diskettes.

The following instructions create an AUTOEXEC.BAT file that loads the NetWare shell and changes to the first network drive. To create a different AUTOEXEC.BAT file, refer to the instructions in your DOS manual.

Note: If you are creating an AUTOEXEC.BAT file for a DOS ODI workstation, the command to load ROUTE.COM should be added after TOKEN.COM but before NET3.

1. Insert a workstation boot diskette into drive A.

2. Type the following text:

Note: If you plan to set DOS ODI workstations to use the Remote Reset feature, you must also include RPLODI.COM with the workstation shell files and add it to the AUTOEXEC.BAT after LSL and before the Token-Ring driver. See Appendix A for more information on the Remote Reset feature.

```
COPY CON AUTOEXEC.BAT  <Enter>
IPX  <Enter>
ROUTE.COM  <Enter>  (optional file, used
    with NetWare Source Routing)
NETBIOS  <Enter> (optional NetWare
    emulator program)
NET3  <Enter>
F:  <Enter>  (or first network drive)
^Z  <Enter>
```

Note: If you plan to use NetWare's emulator program, include the NetBIOS line in the AUTOEXEC.BAT file. Do not include Novell's NetBIOS if you are using IBM's emulator program. The necessary information for IBM's emulator program was copied when you ran the *LAN SUPPORT PROGRAM*.

3. To verify that you have entered the AUTOEXEC.BAT file correctly, type

   ```
   TYPE AUTOEXEC.BAT  <Enter>
   ```

   The workstation screen should display the appropriate version of the shell (NET3.COM or NET4.COM), as well as the drive letter that is mapped to the first network drive. If the information displayed is incorrect, return to Step

You should now have the following files on the boot diskette.

COMMAND.COM

NETBIOS.COM and INT2F.COM
(NetWare's optional emulator program)
or
DXMT0MOD.SYS
(IBM's optional emulator program)

DXMA0MOD.SYS
(optional)

DXMC0MOD.SYS
(optional)

CONFIG.SYS
(optional)

IPX.COM

NET3.COM

SHELL.CFG (if appropriate)

AUTOEXEC.BAT

Once the information on the boot diskette is correct, the computer should boot DOS, load the NetWare shell files, and change to the specified network drive when booted.

If you are installing Remote Reset, see Appendix A.

If you are not installing Remote Reset, you are now ready to boot your Token-Ring stations.

Notes

Appendix A: Setting up the Remote Reset feature

This section explains how to set up Remote Reset for Token-Ring workstations. Remote Reset allows IBM brand workstations and many compatibles to boot from a network (file server) disk.

Remote Reset can be used only under the following conditions:

- The workstation has neither a bootable partition on the hard disk nor a bootable diskette in the floppy diskette drive; and
- The adapter has a generic IBM Remote Reset PROM installed.

Note: Remote Reset can also be used with DOS ODI workstations if the RPLODI.COM file is included with the workstation shell files and added to the NET.CFG file after LSL and before the driver.

Installing Remote Reset boot PROMs

Insert the Remote Reset PROM into the socket as shown in Figure A.1 for ISA adapters and Figure A.2 for microchannel adapters. Be sure to line up the notches on the PROM and the socket.

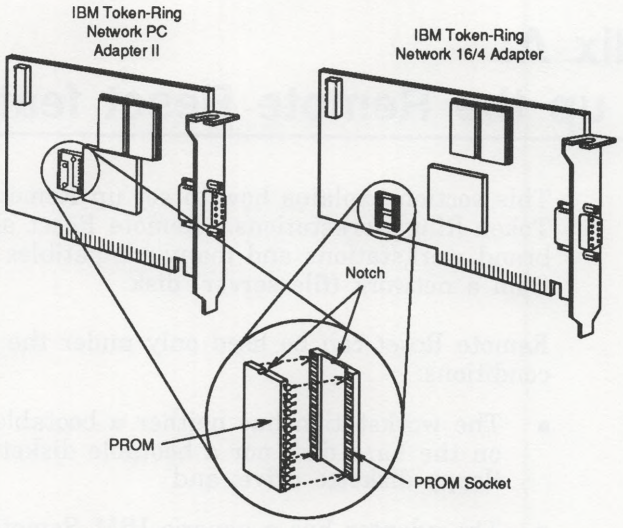


Figure A.1
Installing Remote Reset PROMs on ISA adapters

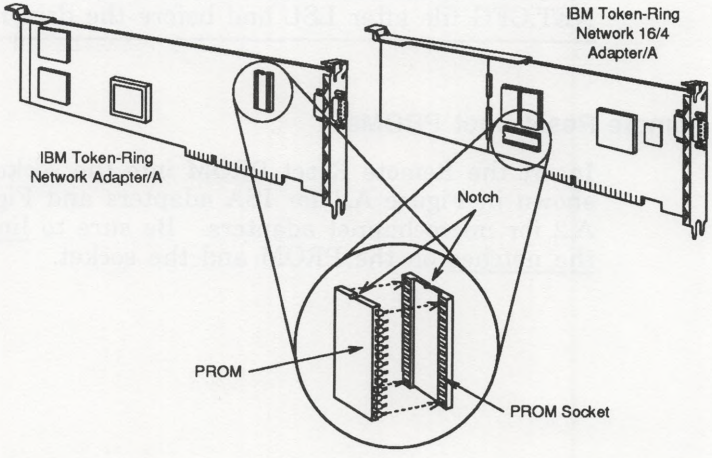


Figure A.2
Installing Remote Reset PROMs on microchannel adapters

Copying and loading the Remote Reset load file

If you are running NetWare v2.*x*, complete the following instructions to copy and load the remote reset load file. If you are running NetWare v3.*x*, see the instructions on the next page.

For NetWare v2.x

To use the LAN drivers and the Remote Reset file on the *LAN_DRV_050* diskette, complete the following steps:

1. Copy the TOKEN.RPL file to the SYS:LOGIN directory.
   a. Insert the *LAN_DRV_050* diskette into drive A.
   b. Log in to the server as SUPERVISOR.
   c. Type

      NCOPY A:TOKEN.RPL SYS:LOGIN <Enter>

2. Copy the RPL.VP1 file to the SYS:SYSTEM directory.
   a. Insert the *LAN_DRV_050* diskette into drive A.
   b. Type

      NCOPY A:RPL.VP1 SYS:SYSTEM <Enter>

3. Load the TOKEN.RPL file.
   a. Log out of the network.
   b. At the console, bring down the file server by typing

      DOWN <Enter>

Note: Make sure that all users on the network are logged out before bringing down the server.

   c. Reboot the file server and load the VAP.

For NetWare v3.x

At the file server console,

1. Type

   ```
   LOAD [path] TOKENRPL  <Enter>
   ```

2. Replace *path* with a full directory path to the directory containing the module; begin with a DOS drive letter or a NetWare volume name.

   If you do not specify a *path* and the SYS volume is mounted, the operating system assumes that the loadable module is located in the SYS:SYSTEM directory. (Use SEARCH to set up additional paths for automatic searching.)

3. Bind the TOKRPL protocol to the driver for the Token-Ring network board(s) in the file server.

   Type

   ```
   BIND TOKRPL LAN_driver  <Enter>
   ```

   Replace *LAN_driver* with the name of the driver you are using. If you have loaded the driver more than once, you will need to repeat this step.

4. Edit the AUTOEXEC.NCF file. Add the following lines to load and bind TOKENRPL.

   ```
   LOAD TOKENRPL
   BIND TOKRPL LAN_driver driver_parameters
   ```

   Replace *LAN_driver* with the name of the driver you used in Step 2.

   Replace *driver_parameters* with the parameters you used to load the LAN driver.

   For instructions on editing the AUTOEXEC.NCF file, see INSTALL in *NetWare v3.11 System Administration*.

Creating Remote Reset boot files

The remote boot file you place in the SYS:LOGIN directory contains the same information as the boot diskette. To copy a remote boot file into the SYS:LOGIN directory, complete the following steps:

Note: Instructions on customizing remote boot files (if all your Remote Reset stations cannot boot from identical boot diskettes) are in the "Workstation Installation" section of *NetWare v3.11 Installation.*

---

1. Insert the boot diskette of the workstation for which you are creating a remote boot file into drive A of the workstation.

2. Log in as SUPERVISOR.

3. Generate DOSGEN image files.

   a. Change to SYS:LOGIN by typing

      G: <Enter>

   b. At the DOS prompt, type

      F:DOSGEN <Enter>

   The F: tells the file server where to find the DOSGEN utility. DOSGEN will create a boot image file called NET$DOS.SYS (from the boot diskette in drive A) and copy the boot image file into the SYS:LOGIN directory.

   The following message displays:

   ```
   Transferring Data to "NET$DOS.SYS"
   ```

   When you turn on the workstation, Remote Reset searches in SYS:LOGIN for the default boot file, NET$DOS.SYS, to determine which files to load into memory so the workstation can boot.

4. Flag the NET$DOS.SYS boot image file Shareable-Read/Write (SRW). At the DOS prompt, type

   FLAG NET$DOS.SYS SRW <Enter>

Remove all diskettes from a workstation with floppy disk drives. To perform a remote boot, turn the workstation on. The workstation will automatically boot from the server.

Appendix B: Planning a large nonmovable cabling system

This appendix identifies the following:

- Network hardware for the nonmovable cabling system
- IBM manuals that contain installation instructions for the large nonmovable cabling system

This appendix does not provide installation instructions for the large nonmovable cabling system. It does, however, list all necessary network hardware and outline the IBM manuals that you need to use.

The large nonmovable cabling system is a very complex system. We recommend that only experienced installers attempt to install it.

Section 1 of this manual identified the network hardware for the small movable cabling system, which is used for a network with up to 96 stations and up to 12 IBM 8228 units.

If your network requires more than 96 stations or 12 IBM 8228 units (up to 260 stations and 33 MAUs), you should use this appendix instead of Section 1 for an overview of the large nonmovable cabling system.

Note: In this supplement, the term "station" refers to servers, bridges, and workstations. This term is synonymous with the term "attaching device" used in IBM manuals.

Hardware for large nonmovable cabling systems

Much of the network hardware used in a large nonmovable cabling system is the same as hardware used in a small movable cabling system. Some network hardware is used only in a large nonmovable cabling system. Both groups of network hardware are described below.

Hardware common to both cabling systems

Following is a list of IBM Token-Ring network hardware used in both small movable and large nonmovable cabling systems. (Each item is illustrated in Figure 1.1 in Section 1.)

Adapters

Token-Ring adapters are the network interface boards that enable stations to function on a Token-Ring network.

For standard-bus (ISA) stations

- IBM Token-Ring PC Adapter
- IBM Token-Ring 16/4 Adapter
- IBM Token-Ring PC Adapter II

For microchannel architecture stations

- IBM Token-Ring PC Adapter/A
- IBM Token-Ring 16/4 Adapter/A.
- IBM Token-Ring 16/4 Busmaster Server Adapter (discussed in Appendix E)

IBM 8228 Multistation Access Units

An IBM 8228 Multistation Access Unit (MAU) is used to connect up to eight stations in a network.

IBM 8228 Setup Aid

An IBM 8228 Setup Aid is used to test the 8228 unit before it is installed.

IBM Token-Ring network adapter cables

An adapter cable is made of 8 feet of IBM type 6 cable. One end connects to the adapter port of a Token-Ring PC or TRN/A adapter. The other end connects to either a patch cable or an IBM 8228 unit.

Patch cables

A patch cable is made of IBM type 6 cable and has a connector at each end. Patch cables may be connected to each other, to adapter cables, or to an IBM 8228 unit.

Hardware specific to large nonmovable cabling systems

The following items are used only in the large nonmovable cabling system (items are illustrated in the IBM manuals listed).

Distribution panels

A distribution panel is mounted in an equipment rack and holds up to 64 data connectors. It performs a patch panel function for the network cables. A distribution panel is illustrated in Chapter 2 of the *IBM Cabling System Planning and Installation Guide*, and in Chapter 1 of the *IBM Token-Ring Network Installation Guide*.

Equipment racks

Equipment racks hold distribution panels and 8228 units. An equipment rack is illustrated in Chapter 2 of the *IBM Token-Ring Network Introduction and Planning Guide*.

Cable brackets

A cable bracket is packaged with each 8228 unit and is used if the unit is installed in an equipment rack. When patch cables (or adapter cables) are connected to an 8228 unit in an equipment rack, the cables snap into the underside of the bracket. A cable bracket is illustrated in Chapter 1 of the *IBM Token-Ring Network Installation Guide*.

IBM Type 1 and Type 2 cable

IBM type 1 or type 2 cable is used to connect a work area to a wiring closet or to connect one wiring closet to another wiring closet. IBM type 1 and 2 cables are illustrated in Chapter 2 of the *IBM Cabling System Planning and Installation Guide.*

Faceplates

Faceplates are used for attaching network stations to the cabling system. Faceplates are illustrated in Chapter 2 of the *IBM Cabling System Planning and Installation Guide.*

Planning the network

Following is a list of IBM manuals that will instruct you in installing a large nonmovable cabling system:

- *IBM Token-Ring Network Introduction and Planning Guide*
- *IBM Token-Ring Network Installation Guide*
- *IBM Cabling System Planning and Installation Guide*
- *IBM Token-Ring Network Telephone Twisted-Pair Media Guide*
- *A Building Planning Guide for Communication Wiring*

This list is selective rather than comprehensive. Using these manuals, plan your network. Make sure that you have all the necessary hardware and that you know where each hardware component will be used in the network layout.

When you have finished planning the network layout, go to Section 2 in this supplement, which explains how to set Token-Ring adapters and install them in network stations.

Appendix C: The TIMERINT.SYS file

Use this appendix if the BIOS date of one or more of the IBM PCs, PC XTs, or PC ATs that you plan to use as workstations is earlier than June 1985. (This does not apply to IBM-compatible computers.)

If you are not sure of the BIOS date of a workstation, insert the *LAN SUPPORT PROGRAM* diskette into drive A. At the prompt, type

```
BIOSDATE <Enter>
```

The BIOS date will appear on the screen.

The *LAN SUPPORT PROGRAM* diskette includes a device driver in a file called TIMERINT.SYS. This device driver replaces the interrupt code on the IBM BIOS (Basic Input/Output System) and lessens the likelihood of the DOS internal stack error.

For each workstation with a BIOS date before June 1985, you must copy the TIMERINT.SYS file from the *LAN SUPPORT PROGRAM* diskette to the workstation boot diskette. To copy the TIMERINT.SYS file, complete the following steps.

1. Insert the *LAN SUPPORT PROGRAM* diskette into drive A, and insert the workstation boot diskette into drive B. (If your computer has only one floppy disk drive, change diskettes as prompted.)

2. At the DOS prompt, type

   ```
   COPY A:\TIMERINT.SYS B: <Enter>
   ```

   The TIMERINT.SYS file is now copied to the workstation boot diskette.

3. Add the following line to the CONFIG.SYS file:

```
DEVICE=TIMERINT.SYS  <Enter>
```

When you add this line to your CONFIG.SYS file, make sure you do not change the content and order of existing lines in the file. (Add the line to the end of the CONFIG.SYS file.)

For more information on CONFIG.SYS files and the DEVICE command, see your DOS manual.

Appendix D: Using the source routing driver

This appendix explains the use of the source routing driver on NetWare networks using Token-Ring adapters. It does not replace the instructions for software generation contained in your NetWare installation manuals.

The source routing driver enables NetWare communication across IBM Token-Ring network bridges.

Guidelines for using the source routing driver

You should understand the following guidelines before attempting to use the source routing driver on the network:

- All stations that will access a server connected through an IBM Token-Ring network bridge must use the source routing driver.
- All file servers and NetWare routers (bridges) connected through an IBM Token-Ring network bridge must use the same network address.

  The IBM Token-Ring network bridge is transparent to NetWare. Rings that are linked together through the bridge are viewed as one ring.

Note: Do not confuse the ring number with the network address used when generating NetWare software. Network addresses for servers and NetWare routers linked through IBM bridges must be the same, but each ring number must be unique.

Figure D.1 shows how networks connected through an IBM Token-Ring network bridge use the same network address.

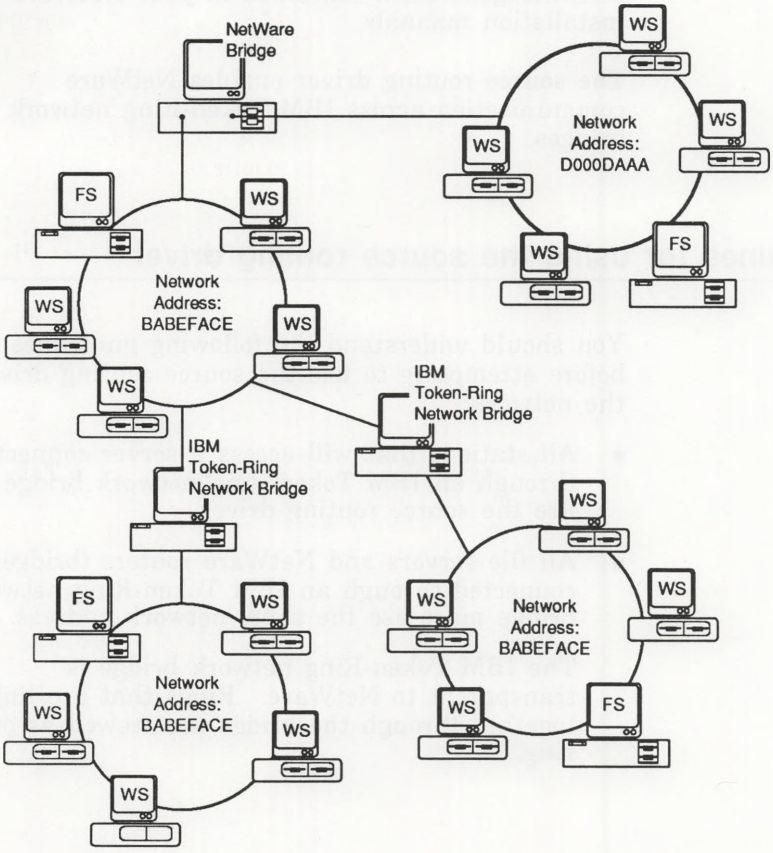


Figure D.1
Using the source routing driver with an IBM Token-Ring network bridge

Using the source routing driver with NetWare v3.*x*

Before you set up NetWare v3.*x* workstations for source routing, you must load ROUTE.NLM on the file server. ROUTE.NLM is the driver that performs source routing on a NetWare v3.*x* file server. Refer to your *NetWare v3.11 System Administration* manual for instructions on loading ROUTE and setting parameters.

After you have loaded ROUTE on the file server, complete the following steps to install source routing on workstations:

1. Create a boot diskette with the NetWare driver for Token-Ring workstations.
2. Copy the ROUTE.COM file from the *DOS/ODI Workstation Services* diskette to the boot diskette.
3. Add the command to load ROUTE.COM to the AUTOEXEC.BAT file as shown in section 4 of this manual.

Note: Steps 2 and 3 should have been completed in Section 4 of this manual, when you prepared your Token-Ring boot diskettes.

---

4. Set the parameters for ROUTE.COM. See "Additional information" on page 70 for the parameters that can be included when you load ROUTE.COM. Add the parameter in the AUTOEXEC.BAT file.

The following parameters can be entered when ROUTE.COM is first loaded:

BOARD = *number*	MBR
CLEAR	NODES = *number*
DEF	REMOVE = *number*
GBR	

The parameters can also be changed by loading ROUTE.COM a second time.

For on-line help, type

```
ROUTE ? <Enter>
```

Most of the parameters have default values that should work with simple configurations for IBM bridges. If you have installed parallel IBM bridges, you can change some of the parameters to reduce traffic on some of the paths. Each parameter is described on the following pages.

BOARD = number

Use this parameter to specify a board number for the Token-Ring adapter.

- If this parameter is not specified, the default of 01 is used.
- If you have loaded more than one LAN driver in the workstation, the board number is determined by the order the LAN drivers are loaded (the first board is 1). See your AUTOEXEC.BAT file for the order you have specified.

CLEAR

Use this parameter to manually clear the source routing table and force a dynamic rebuilding of the table by sending a default frame to each specific node in the network. Use this parameter when an IBM bridge on the network has gone down and an alternate route is available.

DEF

Use this parameter to prevent frames that have unknown (**DEF**ault) destination addresses from being sent across Single Route IBM bridges.

- If this parameter is specified, all frames that have addresses not currently in the workstation's source routing table will be forwarded as All Routes Broadcast frames.
- If this parameter is not specified, all frames that have addresses not currently in the workstation's source routing table will be forwarded as Single Route Broadcast frames.
- If ROUTE.COM has already been loaded with the DEF parameter, reloading ROUTE.COM with this parameter broadcasts all subsequent Single Route Broadcast frames as All Routes Broadcast frames.

GBR

Use this parameter to specify that all **G**eneral **BR**oadcast frames are to be sent as All Routes Broadcast frames.

- If this parameter is not specified when ROUTE is loaded, all General Broadcast frames are broadcasted as Single Route Broadcast frames.
- If ROUTE has already been loaded with the GBR parameter, reloading ROUTE with this parameter broadcasts all subsequent General Broadcast frames as All Routes Broadcast frames.

MBR

Use this parameter to specify that all **M**ulticast **BR**oadcast frames are to be sent as All Routes Broadcast frames.

- If the parameter is not specified when ROUTE is loaded, all Multicast Broadcast frames are broadcast as Single Route Broadcast frames.
- If ROUTE has already been loaded with the MBR parameter, reloading ROUTE with this parameter broadcasts all subsequent Multicast Broadcast frames as All Routes Broadcast frames.

NODES = number

Use this parameter to specify the number of table entries in the source routing table. This parameter must be entered the first time ROUTE.COM is loaded. The parameter cannot be changed by reloading ROUTE.COM.

Replace *number* with a value from 8 to 255. The default is 16.

REMOVE = number

Use this parameter to remove a specified node address from the workstation's source routing table. Removing the node from the source routing table forces the workstation to determine an alternate path when a bridge has gone down.

Replace *number* with a 12-digit (6-byte) hexadecimal number. If less than 9 digits are entered, ROUTE.COM prefixes the address with 4000h. For example, REMOVE=2 is interpreted as REMOVE=400000000002.

Using the source routing driver with NetWare v2.x

If you have NetWare v2.*x* file servers or routers on your network and want to use source routing, you must configure them for source routing.

The source routing file for NetWare v2.*x* file servers and routers is a VAP, and the VAP loads as the file server or router is booted. On a file server, NetWare v2.*x* searches for VAPs in the SYS:SYSTEM directory. On a router, NetWare checks the current drive for VAPs.

Note: VAPs with a numerical extension (.VP0, VP1, etc.) are loaded in numerical order. ROUTE.VP0 has a zero as its last number in the extension because it should be loaded first.

To set up a NetWare v2.*x* file server or router for source routing, you will need to

- Copy ROUTE.VP0 to SYS:SYSTEM for a server or to the root directory for a router.
- Down the file server or router and then reboot.

To complete these tasks, complete the following steps:

1. If you want to configure ROUTE.VP0, use SRCONFIG. SRCONFIG is not required for most router applications, since ROUTE.VP0 is configured for most router applications.

   1a. Insert a working copy of the *Bridge Services and Utilities* diskette into drive A of a workstation and type

   ```
   A:SRCONFIG <Enter>
   ```

   Follow the prompts.

2. Copy the ROUTE.VP0 file (that you have configured on the *Bridge Services and Utilities* diskette).

   - For a NetWare v2.*x* file server, copy it to the SYS:SYSTEM directory
   - For a NetWare v2.*x* router, copy it to the boot directory.

3. Bring down the file server or the router.

4. Reboot the file server or bridge. Answer the prompts so that the VAP loads.

5. If needed, configure the VAP with the specialized parameters. ROUTE.VP0 loads a console command, ROUTE. With ROUTE, you can configure the NetWare v2.*x* file server or router.

Most of the ROUTE.NLM parameters can be used, with the following exceptions:

UNLOAD: This parameter cannot be used with the VAP. You must reconfigure the VAP with SRCONFIG to remove source routing from a LAN driver. To remove source routing from LAN A but retain it for LAN B, use the following command:

```
SRCONFIG <Enter>
```

BOARD: Board number is determined by the LAN. LAN A is board 1; LAN B, 2; etc. LAN A is the default if no board number is specified in a command.

You can change the TIME parameter at the console.

For LAN A, type

```
ROUTE TIME=10 <Enter>
```

For LAN B, type

```
ROUTE BOARD=B TIME=10 <Enter>
```

Note: If you need to permanently configure the VAP with one of these parameters, use SRCONFIG.

Appendix E: Configuring the IBM Token-Ring 16/4 Busmaster Server Adapter/A

This appendix explains the features, configuration, installation, and testing procedures for the IBM Token-Ring 16/4 Busmaster Server Adapter/A.

The IBM Token-Ring Network 16/4 Busmaster Server Adapter/A is a 24-bit microchannel adapter (see Figure E.1 below). You can use up to eight busmaster server adapters in a microchannel file server running NetWare v3.11. Although the adapter provides optimum performance installed in a 32-bit expansion slot, it can also be inserted into a 16-bit slot if no 32-bit slots are available.

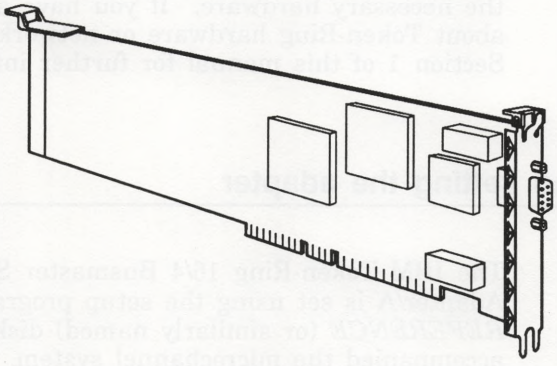


Figure E.1
The IBM Token-Ring 16/4 Busmaster Server Adapter/A

Do not use this adapter in a file server with more than 16MB of memory and more than 8GB of disk storage.

The IBM Token-Ring 16/4 Busmaster Server Adapter/A is functionally different from the IBM Token-Ring 16/4 Adapter/A in two ways:

- **Busmaster capability**

  Busmastering allows the IBM Token-Ring Network 16/4 Busmaster Server Adapter/A to transfer between the network and the server's memory without the aid of the server's CPU. The server's CPU can then process other network tasks more quickly than it otherwise could.

- **Downloadable microcode**

  Downloading microcode allows you to upgrade the IBM Token-Ring Network 16/4 Busmaster Server Adapter/A's firmware without replacing any chips on the adapter. DOWNLOAD.COM (supplied by Novell) allows you to download the firmware (supplied by IBM) to the adapter.

Before you install this adapter in a v3.11 server, you should have designed your network and assembled the necessary hardware. If you have any questions about Token-Ring hardware or network layout, see Section 1 of this manual for further information.

Installing and setting the adapter

The IBM Token-Ring 16/4 Busmaster Server Adapter/A is set using the setup program on the *REFERENCE* (or similarly named) diskette that accompanied the microchannel system.

Preparing the REFERENCE program

The REFERENCE program requires the configuration information and other software on the *OPTION* diskette that came with the IBM Token-Ring 16/4 Busmaster Server Adapter/A.

You should use a working copy of the *REFERENCE* diskette.

1. If you have not already made a working copy of the *REFERENCE* diskette, follow the instructions in the Quick Reference documentation that accompanied the machine and make one.

Note: If you have previously added or removed a network adapter, you may see a configuration error message. You will also see a prompt to automatically configure the system. Answer "No" to the prompt.

2. When you are still in the REFERENCE program, select the menu option to copy the *OPTION* diskette to the working copy of the *REFERENCE* diskette. Follow the instructions in the Quick Reference documentation that accompanied the machine.

Note: Do not use the DOS COPY command to update the *REFERENCE* diskette. Use "Copy an option diskette" in the REFERENCE program.

Inserting the adapter into the server

To insert the IBM Token-Ring 16/4 Busmaster Server Adapter/A into the server, complete the following steps (using the manufacturer's documentation, if necessary):

1. Turn off the power switches and unplug the power cords of the server and peripherals.

2. Disconnect all cables from the back of the server. (Label the cables so that you will know where to reconnect them.)

3. Remove the server's cover according to the manufacturer's instructions, taking precautions against the discharge of static electricity.

4. Insert the adapter into a 32-bit expansion slot according to the manufacturer's instructions. If you do not have an available 32-bit slot, you can use a 16-bit slot.

Setting the adapter

Now that the configuration files and other software have been copied to the working copy of the *REFERENCE* diskette and the adapter has been inserted into the server, you are ready to set the adapter.

The REFERENCE program displays the default settings for the IBM Token-Ring 16/4 Busmaster Server Adapter/A and provides you with access to valid optional settings.

For instructions on running the REFERENCE program, see "Setting microchannel adapters" on page 22 in this manual or refer to the Quick Reference documentation that accompanied the microchannel system. Complete the following steps:

1. Select the Option Identification Label for your language and record the settings as you run the setup program.

2. Insert the working copy of the *REFERENCE* diskette into drive A and boot the microchannel machine.

3. Run the REFERENCE program.

   Select "Set configuration" from the main menu and then "Change configuration". Scroll to the appropriate slot number, and make the following settings for each IBM Token-Ring 16/4 Busmaster Server Adapter/A:

   - **Data rate**

     The default data rate for the adapter is 4 Mbps.

     The other valid data rate is 16Mbps.

You must set all IBM Token-Ring 16/4 adapters on a ring to use the same data rate (either 16Mbps or 4Mbps). Failure to do so will cause network errors.

- **Interrupt level**

  The default is Interrupt 2.

  Other valid levels include Interrupts 3, 4, 5, 7, 10, 11, and 12.

- **I/O address**

  The default I/O address is 86A0-86AF.

  Each valid address consists of a 16-byte block of RAM within the microchannel machine. There are seven additional valid I/O addresses: 96A0, A6A0, B6A0, C6A0, D6A0, E6A0, and F6A0.

  Each adapter installed in the machine must have a unique I/O address.

- **Arbitration level**

  The default arbitration level is E.

  Other valid arbitration levels are 0, 1, 2, 3, 5, 6, 7, 8, 9, A, B, C, and D.

  Each busmaster adapter requires a unique arbitration level for negotiating with other busmaster adapters within the same machine for control of the microchannel bus.

- **Fairness**

  The default is to operate with fairness ON.

  The other valid option is to operate with fairness OFF.

  Fairness determines how a microchannel busmaster adapter negotiates with other busmaster adapters within the same machine for control of the microchannel bus.

  For more information about arbitration fairness, read the IBM publication, *PS/2 Hardware Technical Reference* (part# S68X-2330).

- **Bus release**

  The default is "Maximum."

  The other valid setting is "Immediately."

  The bus release setting determines how long a microchannel busmaster adapter has to relinquish the bus when another adapter preempts it during a DMA operation.

  A setting of "Immediately" causes the adapter to relinquish control of the microchannel bus upon receiving the preempt signal.

  A setting of "Maximum" allows the adapter time to finish critical DMA operations, resulting in better overall performance.

- **Early Token Release (ETR)**

  When the data rate is 16Mbps, the default is to operate with ETR. The other valid option is no ETR.

  Operation with ETR is not valid for Token-Rings with a data rate of 4 Mbps.

  ETR can increase network performance by causing the adapter to release the token immediately upon de-encapsulating the data packet, rather than after it has successfully transferred the de-encapsulated data to the next higher network protocol.

4. With the machine turned off, attach the Option Identification label (where you have recorded the adapter's configuration settings) to the adapter by adhering it to the flat portion of the blue plastic handle, located at the top of the adapter.

5. Replace the machine's cover, reconnect all cables, and restart the machine.

Downloading the microcode

The IBM Token-Ring 16/4 Busmaster Server Adapter/A requires microcode that is not resident on the adapter. The microcode is contained in two files included on the adapter's *OPTION* diskette:

- MONT400.BIN
- WRTRAM.BIN.

To download MONT400.BIN and WRTRAM.BIN to the adapter, you must use DOWNLOAD.COM, a utility supplied by Novell.

When you have located these three files, complete the following steps:

1. Copy all three files—MONT400.BIN, WRTRAM.BIN, and DOWNLOAD.COM—to the same diskette (or to the same directory to which you have mapped a drive).

2. Insert the diskette containing MONT400.BIN, WRTRAM.BIN, and DOWNLOAD.COM into drive A.

3. Change to drive A.

4. Then type

   DOWNLOAD <Enter>

   A message similar to the following appears:

```
Novell Token-Ring DownLoad Utility for IBM DMA Bus
Master  v1.00 (901129)
(C) Copyright 1990 Novell Inc.  All Rights Reserved.

IBM Token-Ring DMA Bus Master FOUND in Slot 2;
    Data Rate = 04 MBps          DMA Level = 0E;
    Interrupt Level = 02  Node Address = 1000 5A4F 00AE;
    Port = 86A0

IBM Token-Ring DMA Bus Master DownLoad SUCCESSFUL
```

You are now ready to test the adapter.

Testing the adapter

The working copy of the *REFERENCE* diskette contains software for testing all components of the machine as well as the configuration files from the IBM Token-Ring 16/4 Busmaster Server Adapter/A's *OPTION* diskette.

The testing program performs a series of diagnostic routines and also asks for information from the user.

Note: Before you begin testing, make sure you know the type of cable that is connected to the adapter, as well as the data rate (4 Mbps or 16 Mbps) of the LAN segment to which the adapter is connected.

To test the adapter, complete the following steps:

1. Insert the working copy of the *REFERENCE* diskette into drive A.
2. Reboot the machine.
3. Test the adapter, following the prompts and the instructions for testing in the Quick Reference documentation that accompanied your microchannel system.

Where to go from here

When you have configured the IBM Token-Ring 16/4 Busmaster Server Adapter/A and have the necessary microcode on board, you are ready to load the NetWare v3.11 server driver.

TOKENDMA.LAN is the server driver for the IBM Token-Ring 16/4 Busmaster Server Adapter/A. For information about loading and binding the TOKENDMA.LAN driver, see LOAD *LAN driver* and BIND in *NetWare v3.11 System Administration*.

The TOKENDMA.LAN parameters are similar to TOKEN.LAN parameters discussed in LOAD *LAN driver*:

FRAME=*name*	Same default and supported values as TOKEN
NAME=*name*	Same default and supported values as TOKEN
NODE=*number*	Same default and supported values as TOKEN
PORT=*number*	Specify the I/O address you selected when you configured the board. The default and supported values are listed on page 79 of this manual. You can specify PORT rather than SLOT if you want to.
SLOT=*number*	Specify the slot that holds the adapter.

For information about using the NetWare source routing driver with the Token-Ring 16/4 Busmaster Adapter/A, see Appendix D of this manual.

Notes

Appendix F: Using TRCONFIG to configure NetWare v2.*x* server drivers

This appendix explains how to use the TRCONFIG utility to configure a NetWare v2.*x* Token-Ring server driver.

The default values for the following resources can be changed:

- **Shared RAM address**
- **Node address**
- **Transmit buffer size**

For more information on these parameters, see index references to "Shared RAM" in this manual and the LOAD *LAN driver* discussion of TOKEN.LAN in *NetWare v3.11 System Administration*.

Command format

TRCONFIG [VOL=*path*] *LAN* [*driver_parameter*]

All parameters are separated by either blanks or commas. The command is not case-sensitive. Enter "?" to display parameters.

Command parameters

Replace *path* with the full path to the directory containing the LAN drivers. Begin with a DOS drive letter or a NetWare volume name. (If the LAN drivers are in your current directory, you do not need to specify the directory path.)

Type in the letter of the LAN the Token-Ring adapter supports (replace *LAN* with "A", "B", "C", or "D".)

MEMP

The default value is MEMP=D800. This hexadecimal number specifies the shared RAM segment of the primary adapter. This value is ignored if the driver is run on a microchannel machine.

MEMA

The default value is MEMA=D400. This hexadecimal number specifies the shared RAM segment of the alternate adapter. This value is ignored if the driver is run on a microchannel machine.

NODE

This parameter specifies the hexadecimal node address. The prefix "4000" is automatically added to this number to form a 6-byte locally administered address: 4000 *xxxx xxxx*.

TBZ

This parameter specifies a decimal number from 512 to 65535 for the transmit buffer size. The default value is "TBZ=4096". If the number specified is between 1 and 512, then 512 will be used. The driver adjusts the number specified to the nearest power of 2. The driver may also adjust the number specified to the largest packet size the adapter accepts.

Configuring a NetWare v2.*x* Token-Ring server driver

To configure a v2.*x* Token-Ring server driver, complete the following steps:

1. Copy the appropriate Token-Ring server driver to a directory or a floppy diskette.

   For example, the server driver for LAN A is ATOKENA2.OBJ.

   For LAN B, the server driver is BTOKENA2.OBJ, and so on.

2. Copy the TRCONFIG utility to the same directory or floppy diskette.

3. If you copied the files to a directory, map a drive to the directory that contains the files. Then change to that directory.

   If you copied the files to a floppy diskette, place it in a floppy diskette drive.

4. Type

   TRCONFIG <Enter>

   A prompt displays requesting you to enter parameters.

5. Specify the appropriate LAN, LAN "A", LAN "B", and so on. If you are not in the directory that contains the server driver, specify the *path* first.

   A prompt displays requesting you to enter parameters.

6. Specify the parameters you want to change and the new values. For example, if you wanted to change the shared RAM setting for a primary adapter, you would type (substituting a 4-digit hexadecimal value)

   MEMP=*xxxx* <Enter>

   The changed value displays with the following message:

   ```
   Configuration SUCCESSFUL; date on file changed
   ```

The driver is ready to link to the operating system (or if you are reconfiguring the system, you must re-link the driver and OS).

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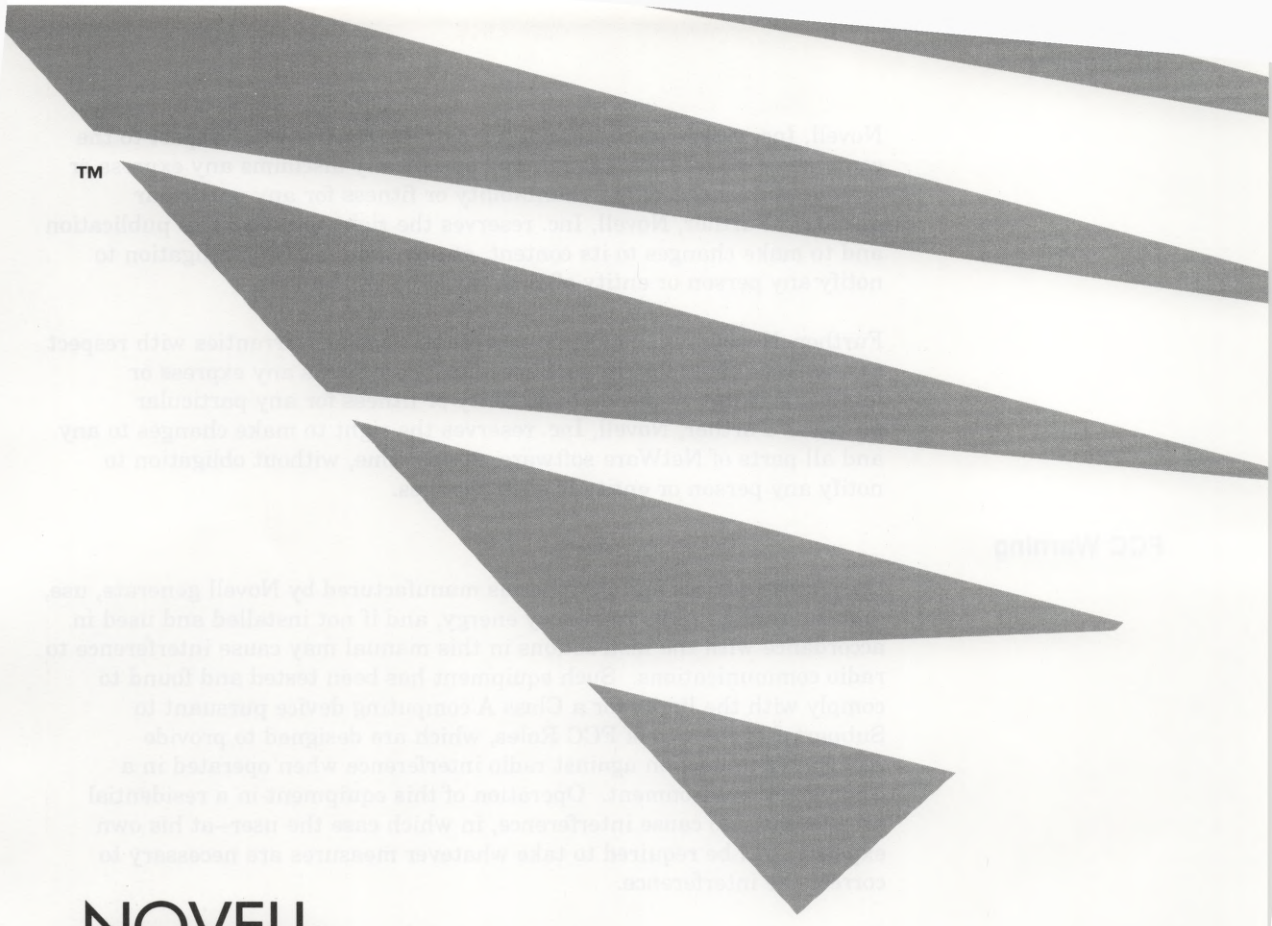

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How to use this manual

This manual explains how to install IBM PC networking hardware on a NetWare network. It is a supplement to your main NetWare manual.

If you have not already done so, read and follow the instructions in the main NetWare manual up to the point where it advises you to consult this supplement.

Four adapters are discussed in this supplement. The IBM PC Network Adapter II and the IBM PC Network Baseband Adapter are for use in industry standard architecture (ISA) machines.

The IBM PC Network Adapter II/A and the IBM PC Network Baseband Adapter/A are for use in microchannel (MCA) machines.

Manual organization

This manual contains two main sections.

Section 1: The IBM PC broadband network

This section reviews broadband network hardware, cabling, and the rules and limitations for laying out a broadband network. It also explains how to plan a network and how to prepare and install the networking hardware.

It also gives instructions for configuring the following broadband adapters in ISA and microchannel (MCA) machines used as workstations, routers (bridges), and file servers running NetWare v2.*x* and v3.*x*:

- IBM PC Network Adapter II (ISA)
- IBM PC Network Adapter II/A (MCA)

Section 1 also gives instructions for cabling a broadband PC Network.

Section 2: The IBM PC baseband network

This section reviews baseband network hardware and cabling, and lists the rules and limitations for laying out a baseband network. It also explains how to plan a network and how to prepare and install the networking hardware.

It also gives instructions for configuring the following baseband adapters in ISA and microchannel (MCA) machines used as workstations, routers (bridges), and file servers running NetWare v2.*x* and v3.*x*:

- IBM PC Network Baseband Adapter (ISA)
- IBM PC Network Baseband Adapter/A (MCA)

Section 2 also gives instructions for cabling a baseband PC Network.

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Section 1: The IBM PC broadband network

This section provides an overview of the hardware and cable requirements for a broadband IBM PC network. It also explains how to design a network layout and how to set and install IBM PC network adapters.

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Note: Baseband and broadband hardware cannot be used on the same network. However, you can use a router (bridge) to connect a baseband network and a broadband network.

The new drivers (unlike the older NetWare v2.*x* PCN2 drivers) use the same frame format as that used by the IBM LAN Support Program. The two frame formats are incompatible. Consequently, networks using the new IBM LAN Support Program-compatible drivers cannot communicate with NetWare v2.*x* networks that use the older PCN2 drivers with Novell frame format. See page 31 for possible solutions.

Figure 1.1 on page 3 shows a basic IBM PC broadband network that supports from two to eight stations. Lengths of coaxial cable (up to 200 feet long) connect the stations to an 8-way splitter, as shown in the figure.

Stations use two frequencies for communication. A network station or device transmits a data signal to the translator unit at a certain frequency. The translator unit converts the data signal to a higher frequency and rebroadcasts the signal over the network. Although all stations on the network can "hear" the rebroadcast signal, only the station specifically addressed receives the data.

You can expand a basic network by using "distance kits" that contain additional hardware. You can increase the number of stations to 72 and extend the distances between them by adding up to eight distance kits. (See page 10 for more information on distance kits.)

Broadband network hardware

The hardware needed to set up an IBM PC broadband network is described in this section and illustrated in Figures 1.2, 1.3, and 1.4.

Transformer

The transformer supplies power to the translator unit.

Translator Unit

The centrally placed translator unit receives signals from network stations, converts them to a higher frequency, and rebroadcasts the signals to the appropriate stations. Only one translator unit is required for each broadband network.

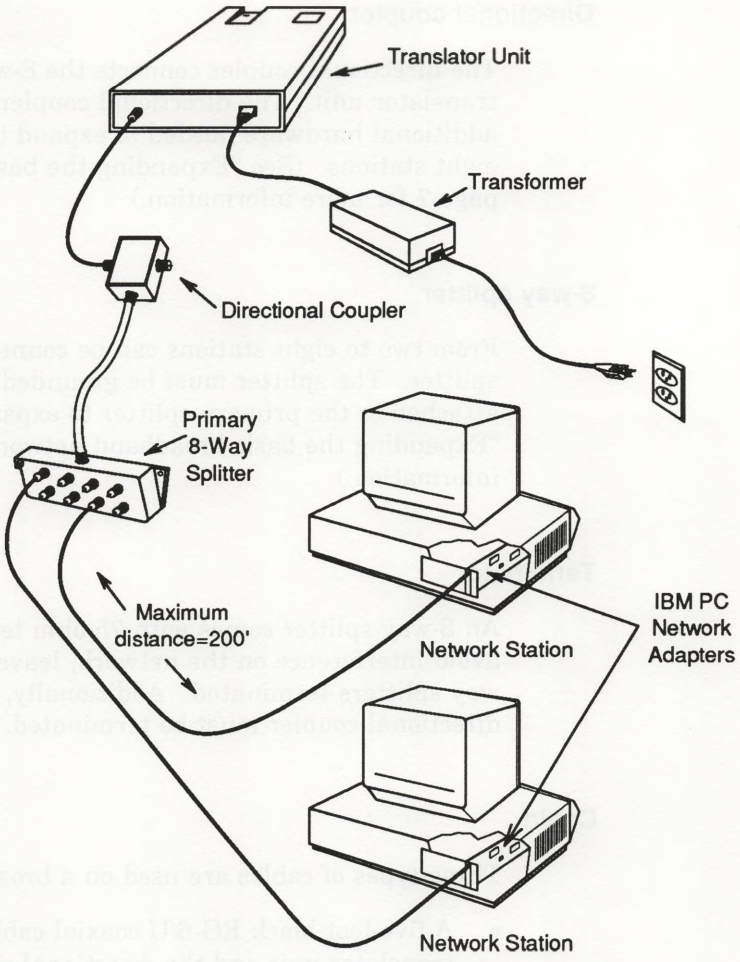

Figure 1.1
Basic IBM PC broadband network

Directional coupler

The directional coupler connects the 8-way splitter to the translator unit. The directional coupler is also used to attach the additional hardware needed to expand the basic network beyond eight stations. (See "Expanding the basic broadband network" on page 7 for more information.)

8-way splitter

From two to eight stations can be connected to the primary 8-way splitter. The splitter must be grounded. (Other splitters can be attached to the primary splitter to expand the network. See "Expanding the basic broadband network" on page 7 for more information.)

Terminator

An 8-way splitter comes with 75-ohm terminators on the taps. To avoid interference on the network, leave all unused ports on the 8-way splitters terminated. Additionally, unused ports on the directional coupler must be terminated.

Cable

Three types of cables are used on a broadband network:

- A five-foot black RG-6/U coaxial cable is used to connect the translator unit and the directional coupler.
- A one-foot beige RG-6/U coaxial cable is used to connect the directional coupler and the 8-way splitter.
- Lengths of RG-11/U or RG-59/U coaxial (station) cable up to 200 feet in length are used to connect stations to the 8-way splitter. Cables come in lengths of 25, 50, 100, and 200 feet.

Cable adapter

Cable adapters are used to connect two lengths of station cable by replacing the 75-ohm terminator on one end of a cable. The other cable is then connected to the cable adapter.

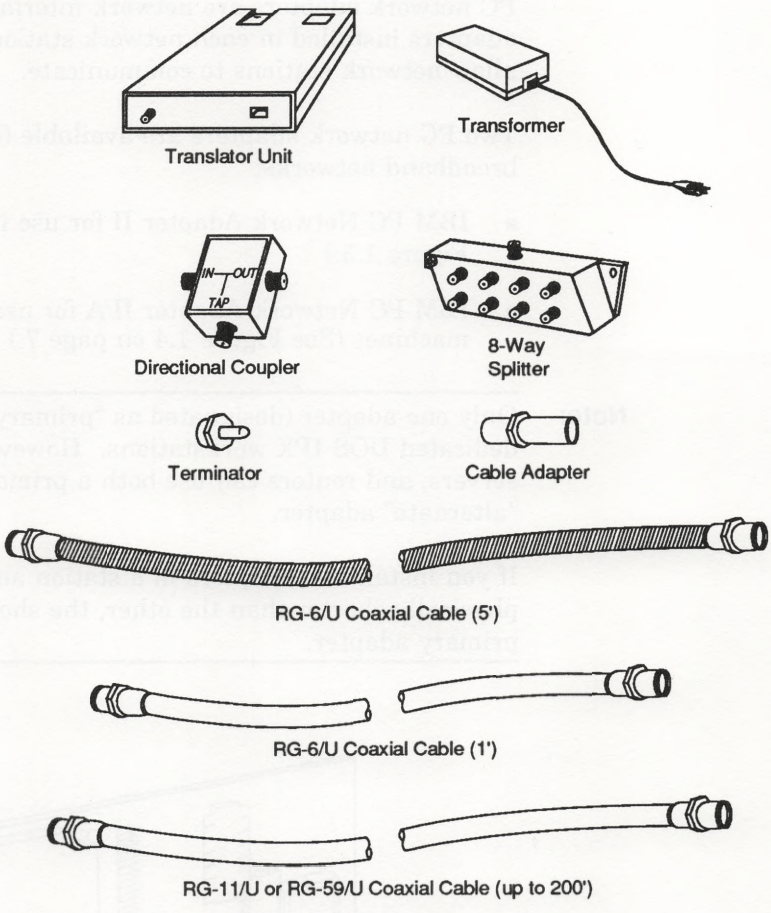

Figure 1.2
Broadband network hardware

PC network adapters

PC network adapters are network interface boards. PC network adapters installed in each network station and cabled together allow network stations to communicate.

Two PC network adapters are available for use on IBM PC broadband networks:

- IBM PC Network Adapter II for use in ISA machines (See Figure 1.3.)
- IBM PC Network Adapter II/A for use in microchannel machines (See Figure 1.4 on page 7.)

Note: Only one adapter (designated as "primary") can be installed in dedicated DOS IPX workstations. However, ODI workstations, file servers, and routers can use both a primary adapter and an "alternate" adapter.

If you install two adapters in a station and one of the adapters is physically shorter than the other, the shorter one must be the primary adapter.

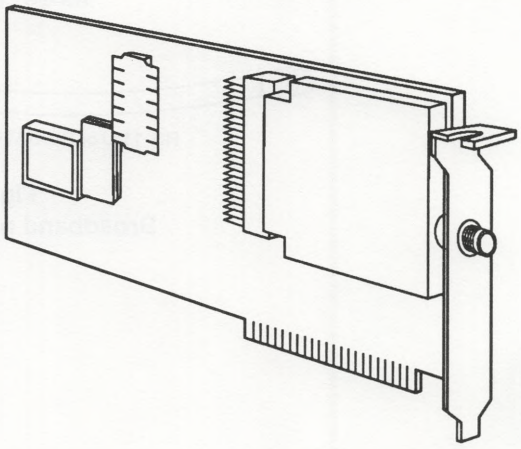

Figure 1.3
IBM PC Network Adapter II

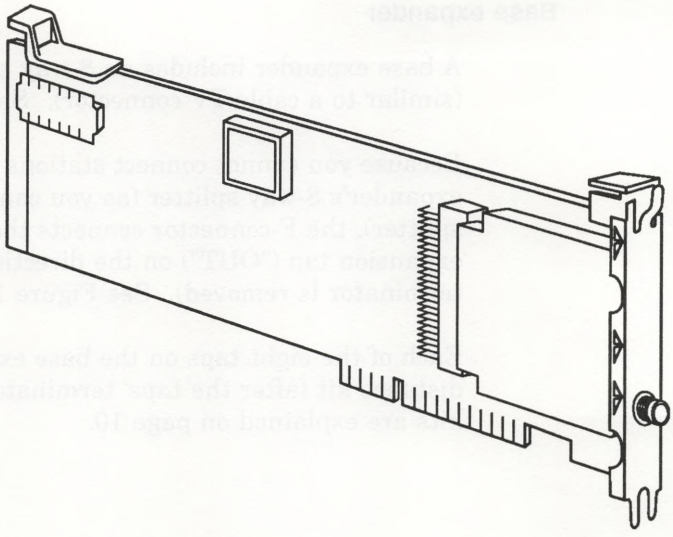

Figure 1.4
IBM PC Network Adapter II/A

If you plan to limit your network to a maximum of eight stations, turn to "Planning the network layout" on page 12.

Expanding the basic broadband network

A basic broadband network supports up to eight stations connected directly to the 8-way splitter using cables up to 200 feet long.

If you want to increase the number of network stations and extend cable lengths beyond 200 feet, you can connect distance kits to the network using a base expander.

Base expander

A base expander includes an 8-way splitter and an F-connector (similar to a cable TV connector). See Figure 1.5.

Because you cannot connect stations directly to the base expander's 8-way splitter (as you can to the primary 8-way splitter), the F-connector connects the base expander to the expansion tap ("OUT") on the directional coupler (after the tap's terminator is removed). See Figure 1.6 on page 9.

Each of the eight taps on the base expander can be connected to a distance kit (after the taps' terminators are removed). Distance kits are explained on page 10.

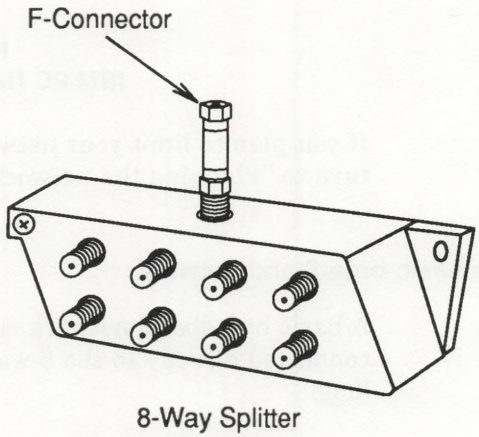

Figure 1.5
Base expander

Each distance kit attaches to one of the taps on the base expander, and each allows the addition of eight more stations to the network. (See Figure 1.6.)

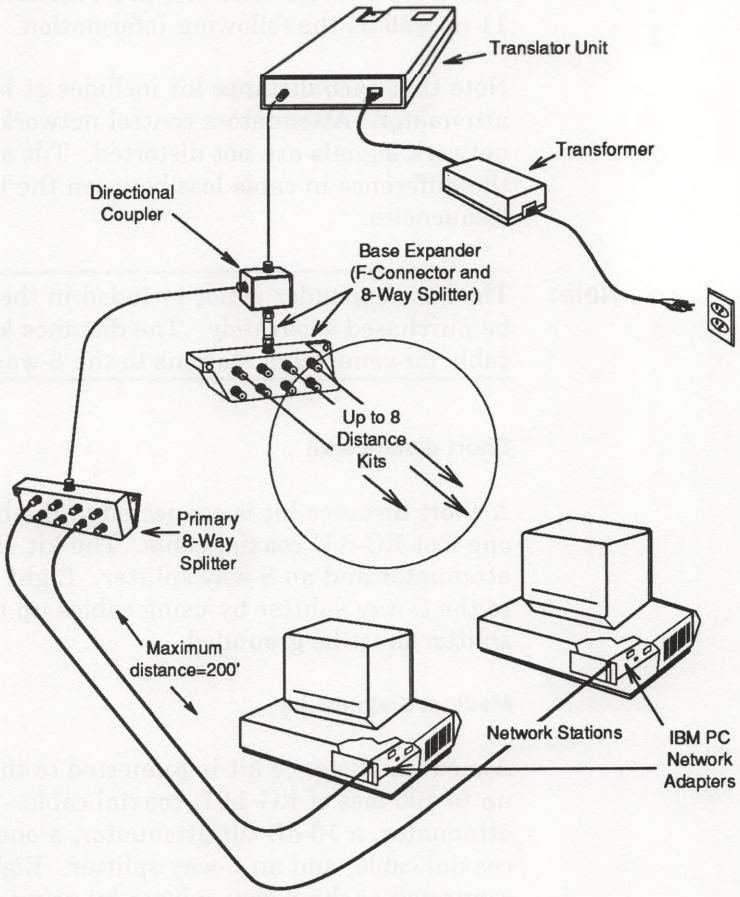

Figure 1.6
Expanding an IBM PC basic broadband network using a base expander and distance kits

Distance kits

Three types of distance kits are available. See Figure 1.7 on page 11 as well as the following information.

Note that each distance kit includes at least one attenuator or tilt attenuator. Attenuators control network frequency to ensure that network signals are not distorted. Tilt attenuators compensate for the difference in cable loss between the higher and lower frequencies.

Note: The base expander is not included in the distance kits and must be purchased separately. The distance kits also do not include cable for connecting stations to the 8-way splitters.

Short distance kit

A short distance kit is connected to the base expander by using a one-foot RG-6/U coaxial cable. The kit also includes a 20-dB attenuator and an 8-way splitter. Eight stations can be connected to the 8-way splitter by using cables up to 200 feet long. The splitter must be grounded.

Medium distance kit

A medium distance kit is connected to the base expander by using up to 400 feet of RG-11/U coaxial cable. The kit includes one 8-dB attenuator, a 10-dB tilt attenuator, a one-foot length of RG-6/U coaxial cable, and an 8-way splitter. Eight stations can be connected to the 8-way splitter by using cables up to 200 feet long. The splitter must be grounded.

Long distance kit

A long distance kit is connected to the base expander by using up to 800 feet of RG-11/U coaxial cable. The kit includes one 10-dB tilt attenuator, one 5-dB tilt attenuator, a one-foot length of RG-6/U coaxial cable, and an 8-way splitter. Eight stations can be connected to the 8-way splitter by using cables up to 200 feet long. The splitter must be grounded.

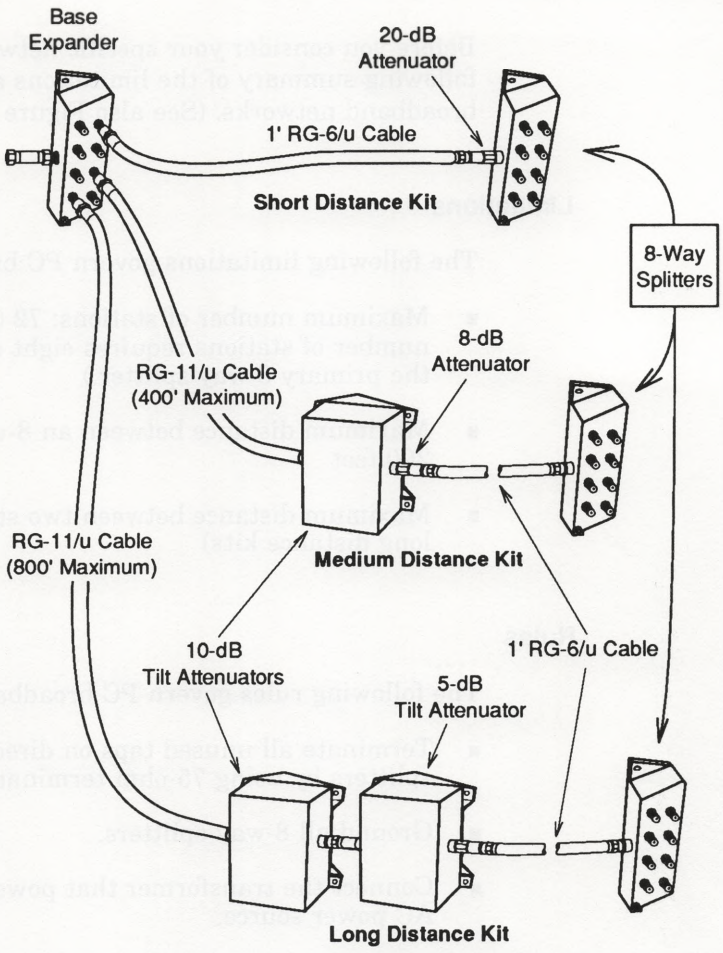

Figure 1.7
Distance kits

Before you consider your specific network needs, review the following summary of the limitations and rules that apply to PC broadband networks. (See also Figure 1.8 on page 13.)

Limitations

The following limitations govern PC broadband networks:

- Maximum number of stations: 72 (To hook up the maximum number of stations requires eight distance kits in addition to the primary 8-way splitter.)
- Maximum distance between an 8-way splitter and a station: 200 feet
- Maximum distance between two stations: 2,000 feet (using two long distance kits)

Rules

The following rules govern PC broadband networks:

- Terminate all unused taps on directional couplers and 8-way splitters by using 75-ohm terminators.
- Ground all 8-way splitters.
- Connect the transformer that powers the translator unit to an AC power source.
- Connect the file server anywhere on the network.
- Be careful not to crimp the cable, damage its insulation, or run it near heat sources or in heavy traffic areas where hand trucks or rolling chairs might damage it.

For additional information, consult the *IBM PC Network Broadband Planning Guide*.

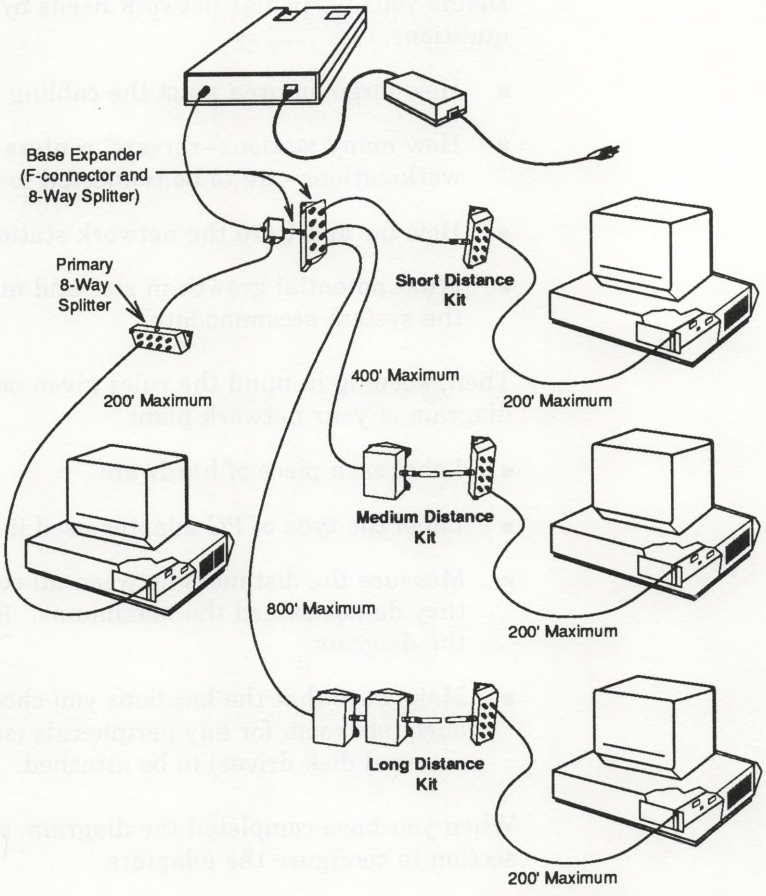

Figure 1.8
Expanded PC broadband network

Other planning considerations

Define your particular network needs by considering the following questions:

- How large an area must the cabling system cover?
- How many stations–servers, routers (bridges), and workstations–are to be connected to the cabling system?
- How far apart are the network stations to be?
- What potential growth in size and number of connections must the system accommodate?

Then, keeping in mind the rules given on page 12, make a diagram of your network plan:

- Label each piece of hardware.
- Label the type of PC adapter used in each station.
- Measure the distances between all components and make sure they do not exceed the maximums. Record these distances on the diagram.
- Make sure that the locations you choose for file servers have adequate room for any peripherals (such as printers and external disk drives) to be attached.

When you have completed the diagram, continue with the next section to configure the adapters.

Configuring broadband adapters

To simplify network setup and administration, record the configuration information for each adapter on a string tag, an adhesive label, or some other form of identification attached to the adapter.

Refer to the following items:

- The diagram of the network layout you were advised to make.
- The worksheets you filled out in the main NetWare installation manual either when you planned or configured the server operating system and router software, or when you set the LAN driver for each workstation.

Label each board with the following information:

- **Type of station.** The type of station into which the adapter is to be inserted may be a workstation, router, NetWare v2.*x* file server, or NetWare v3.*x* file server.
- **Specific network station.** The specific network station in which the adapter is to be installed is identified by its intended physical location or user.
- **The adapter type.** The primary (default) adapter is the first or only IBM PC network adapter in the machine. You can install an alternate adapter only as a second adapter in a file server, router (bridge), or ODI workstation.

  If you install two adapters in a station and one of the adapters is physically shorter than the other, the shorter one must be the primary adapter.
- **ROM BIOS.** ROM BIOS must be either enabled or disabled for all adapters. Enable ROM BIOS on the primary adapter. Disable ROM BIOS for any alternate adapters.

- **Remote Reset.** Although using the Remote Reset feature to allow workstations to boot from a network (file server) hard disk (instead of a local drive) is optional, Remote Reset must be either enabled or disabled for all adapters. Only the primary adapter can use Remote Reset. (Adapters come with a boot PROM already installed.)

Note: Microchannel machines without hard disks can use the Remote Reset feature. Simply remove the boot diskette from the floppy disk drive.

- **Configuration option.** Record this after reading "Default settings" and "Planning the configuration option" on page 17.

If you plan to use the IBM PC Network Adapter II for ISA machines on a broadband network, continue with "IBM PC Network Adapter II (ISA)" in the following section.

If you plan to use the IBM PC Network Adapter II/A for microchannel machines on a broadband network, skip to page 23 for instructions on inserting and setting microchannel adapters.

IBM PC Network Adapter II (ISA)

This section explains how to set and install the IBM PC Network Adapter II for broadband networks. The adapter can be inserted in ISA file servers, routers (bridges), or workstations.

Note: Only one adapter (designated as "primary") can be installed in dedicated DOS IPX workstations. However, ODI workstations, file servers, and routers can use both a primary adapter and an "alternate" adapter.

If you install two adapters in a station and one of the adapters is physically shorter than the other, the shorter one must be the primary adapter.

The adapter can also be inserted into an ISA slot in EISA machines.

Default settings

The IBM PC Network Adapter II for broadband networks is set to the following defaults:

- Configuration option 0
  - IRQ2
  - Base I/O address: 620h (Primary)
  - Base memory address: CC000h
- ROM BIOS enabled (Primary uses memory address D0000h-D7FFFh.)
- Remote Reset disabled

Planning the configuration option

The configuration option includes the interrupt request line, base I/O address, and base memory address.

The base I/O address determines the adapter type, primary or alternate. The adapter type, in turn, determines whether ROM BIOS must be enabled or disabled.

Make sure the interrupt, base I/O address, and base memory address you choose for the adapter are unique; no other boards (including a PC network adapter) or hardware should use conflicting settings. If you have a hardware conflict, you must choose another option for the conflicting adapter.

For DOS IPX workstations, you must select the same numbered configuration option when you generate and set the LAN driver in IPX.COM file. The adapter and LAN driver settings must match.

Note: ODI drivers for the workstations do not use numbered configuration options. If you have a hardware conflict, you only need to reset the adapter and then specify the interrupt, base I/O address, and base memory address in the NET.CFG file. For further information, see *NetWare ODI Shell for DOS.*

Note: When you use similar workstation adapters, you can simplify creating workstation files and master boot diskettes by using the same configuration for each workstation adapter (as long as none of the stations has devices that require conflicting settings).

Determine the configuration for each adapter, using the information in Figure 1.9, and record the configuration information for each adapter on the attached tag or label.

For primary workstation adapters. Refer to Figure 1.9.

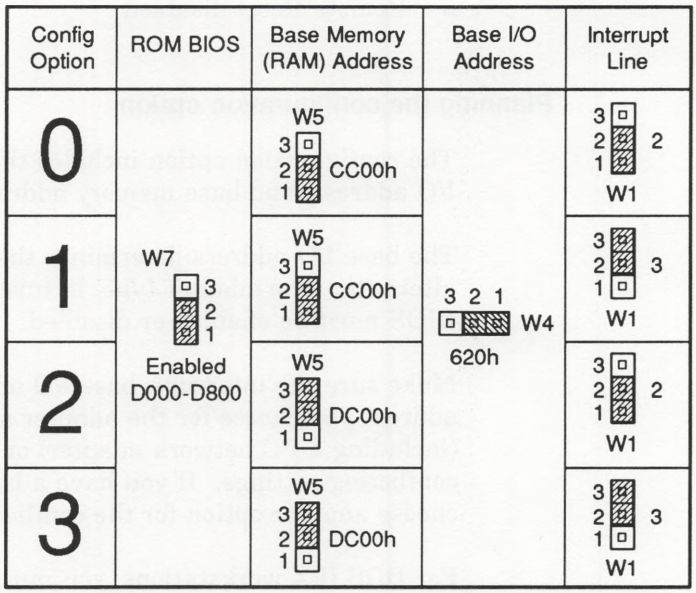

Figure 1.9
Configuration options for primary adapters in workstations

For alternate workstation adapters. This is the second adapter in an ODI workstation. Refer to Figure 1.10. Make sure the settings you choose for the interrupt line and the base memory address do not conflict with the values set for the primary adapter.

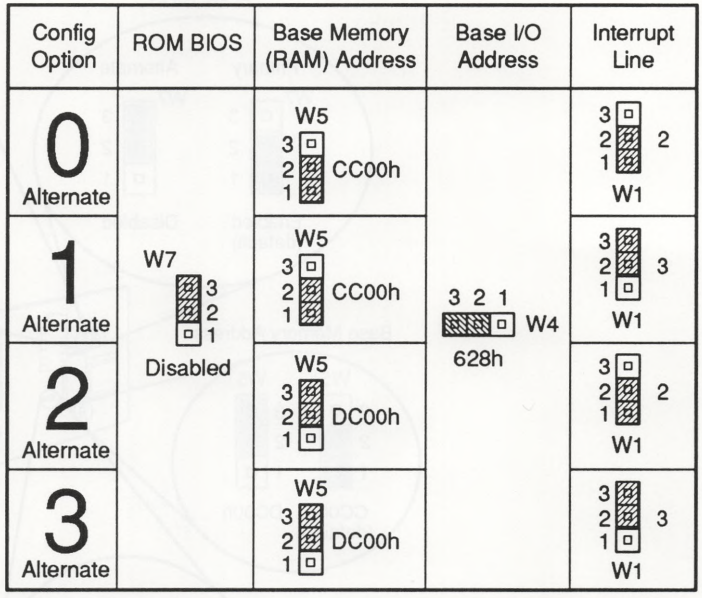

Figure 1.10
Configuration options for alternate server or router adapters in workstations

For primary server or router adapters. We recommend that you use option 0 settings shown in Figure 1.9 where possible, but you can use any supported value. Make sure the interrupt line and the base memory address settings do not conflict with the values you set for the alternate adapter.

For alternate server or router adapters. Use any supported value shown in the numbered configuration options in Figure 1.10. Make sure the interrupt line and the base memory address settings do not conflict with the values set for the primary adapter.

Configuring the adapter

To determine the location of the components used to set IBM PC Network Adapter II, refer to Figure 1.11.

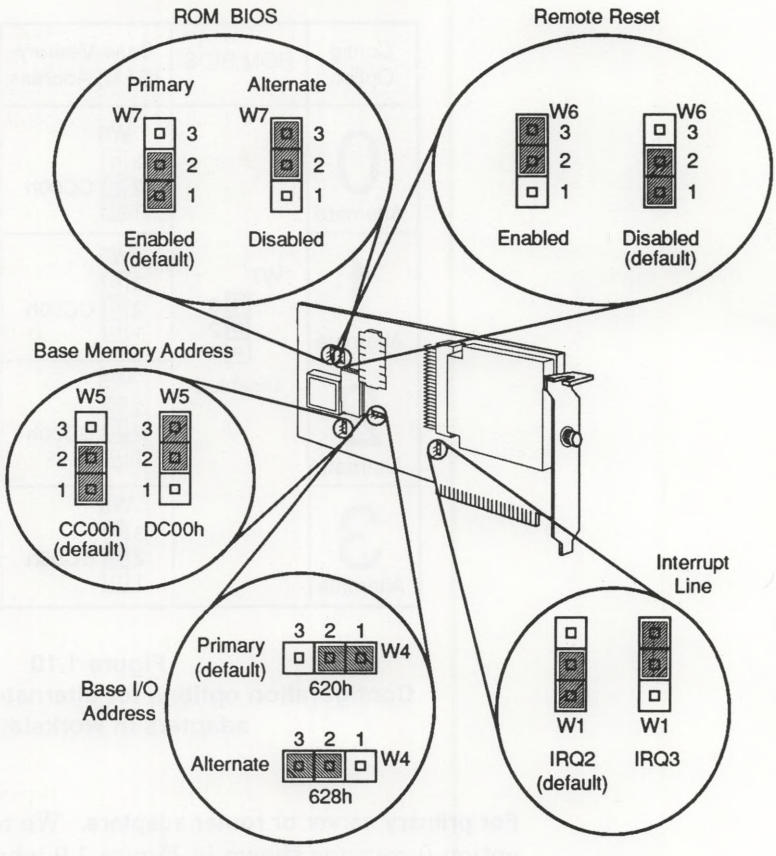

Figure 1.11
Location of components used in configuring an IBM PC Network Adapter II

Set each adapter by completing the following steps:

1. Refer to Figure 1.11 to locate the components used to set the adapter and the position of the jumpers for each setting.

2. Identify the settings you plan to use by checking the tag or label you attached to each IBM PC Network Adapter II.

3. Set the base I/O address and enable/disable ROM BIOS according to the adapter type.
   - For base I/O address, use jumper block W4.
   - For ROM BIOS, use jumper block W7.
     - For primary adapters, base I/O address=620h and ROM BIOS is enabled (uses memory address D0000h-D7FFFh).
     - For alternate adapters, base I/O address=627h and ROM BIOS is disabled.

4. Set a unique interrupt line and base memory address for each PC Network adapter in a machine.
   - For IRQ, use jumper block W1.
   - For base memory address, use jumper block W5.

5. Using Figure 1.11, locate jumper block W6 and then do one of the following (according to your plans):
   - Enable Remote Reset on adapters for all v2.*x* workstations that will boot from the file server hard disk.
   - Disable Remote Reset on all other adapters.

Note: Before you can use Remote Reset, you must also load the appropriate .RPL file (matches the driver) in the SYS:SYSTEM directory on the file server and reboot the server.

Installing the adapter

To install an IBM PC Network Adapter II in a network station, complete the following steps using the documentation that accompanied the machine:

1. Turn off each network station and unplug the power cord.
2. Remove the cover according to the manufacturer's instructions.
3. Remove the metal dummy bracket from an open slot in each station.
4. Insert each adapter into the appropriate station, pressing it completely into the expansion slot connector.
5. Replace the station's cover.

Where to go from here

If you have set and installed all the adapters you plan to use on your broadband network, turn to "Cabling a broadband network" on page 30.

If your broadband network also includes microchannel machines, continue with the instructions on page 23 for setting the IBM PC Network Adapter II/A.

IBM PC Network Adapter II/A (MCA)

This section explains how to install and set the IBM PC Network Adapter II/A for broadband networks.

The adapter can be inserted into microchannel file servers, routers (bridges), and workstations. Only one adapter (designated as "primary") can be installed in a dedicated DOS IPX workstation. However, ODI workstations, file servers, and routers can use both a primary and an "alternate" adapter.

The IBM PC Network Adapter II/A is configured by software after the board is inserted into the network station.

Default settings

The IBM PC Network Adapter II/A for broadband networks must be configured using the *REFERENCE* (or similarly-named) diskette.

The first or only adapter in a machine is designated as primary. Only a primary adapter can use Remote Reset. Selecting an RPL setting for a PC network adapter (in a diskless microchannel workstation) makes it the primary adapter as well.

The second adapter in a machine is designated as alternate.

For other resources, select any supported value (as long it does not conflict with settings required by any other board or device).

Newer IBM PS/2 machines (beginning with model 70 25Mhz 386 or 486) have a "Preempt" setting that defaults to enabled. Use the REFERENCE program to disable "Preempt." Otherwise, the system bus hangs.

Planning the configuration option

The configuration option includes the following:

- **Adapter type**

  Primary, alternate, or RPL (a primary adapter that uses Remote Reset):

  - Primary and RPL use base I/O=620h-627h and ROM BIOS enabled (memory address D0000h-D7FFFh).
  - Alternate uses base I/O=628h-62F and ROM BIOS disabled.

- **Base memory (RAM) address**

  Mem 1 (CE000h-CFFFFh), Mem 2 (D6000h-D7FFFh), and Mem 3 (DE000h-DFFFFh)

- **Interrupt line**

  Int 2 (IRQ2) and Int 3 (IRQ3)

Make sure the interrupt, base I/O address, and base memory address you choose for the adapter are unique; no other boards (including a PC network adapter) or hardware should use conflicting settings. If you have a hardware conflict, you must choose another option for the conflicting adapter.

For DOS IPX workstations, you must select the same configuration option when you set the LAN driver in IPX.COM file. The adapter and LAN driver settings must match.

Note: ODI drivers for the workstations do not use numbered configuration options. If you have a hardware conflict, you only need to reset the adapter and then specify the interrupt, base I/O address, and base memory address in the NET.CFG file. For further information, see *NetWare ODI Shell for DOS*.

Note: When you use like workstation adapters, you can simplify creating workstation files and master boot diskettes by using the same configuration for each workstation adapter (as long as none of the stations has devices that require conflicting settings).

Determine the configuration for each adapter, using the information on the following pages, and record the configuration information for each adapter on the attached tag or label.

For primary workstation adapters

Use the following table. The Remote Reset settings are in a separate table. (The only difference is that you select "RPL" rather than "Primary.")

Note: If you plan to have an alternate adapter in the same machine, use Int 2.

Option	Type	Memory Location	Interrupt Level
4	Primary	Mem 1	Int 2
5	Primary	Mem 2	Int 2
6	Primary	Mem 3	Int 2
7	Primary	Mem 1	Int 3
8	Primary	Mem 2	Int 3
9	Primary	Mem 3	Int 3

For Remote Reset for a primary adapter in a diskless microchannel workstation

Use the following table:

Note: If you plan to have an alternate adapter in the same machine, use Int 2.

Type	Memory Location	Interrupt Level
RPL	Mem 1	Int 2
RPL	Mem 2	Int 2
RPL	Mem 3	Int 2
RPL	Mem 1	Int 3
RPL	Mem 2	Int 3
RPL	Mem 3	Int 3

For alternate workstation adapters (the second adapter in an ODI workstation)

Use the following table:

Type	Memory Location	Interrupt Level
Alternate	Mem 1	Int 3
Alternate	Mem 2	Int 3
Alternate	Mem 3	Int 3

For primary server or router adapters

Use the following table:

Note: If you plan to have an alternate adapter in the same machine, use Int 2.

Type	Memory Location	Interrupt Level
Primary	Mem 1	Int 2
Primary	Mem 2	Int 2
Primary	Mem 3	Int 2
Primary	Mem 1	Int 3
Primary	Mem 2	Int 3
Primary	Mem 3	Int 3

For alternate server or router adapters

Use the following table:

Type	Memory Location	Interrupt Level
Alternate	Mem 1	Int 3
Alternate	Mem 2	Int 3
Alternate	Mem 3	Int 3

Installing the microchannel adapter

To insert an IBM PC Network Adapter II/A in a microchannel machine, complete the following steps using the documentation that accompanied the machine:

1. Turn off each network station, disconnect any peripherals, and unplug power cords.
2. Remove the cover according to the manufacturer's instructions.

Installing the microchannel adapter

To insert an IBM PC Network Adapter II/A in a microchannel machine, complete the following steps using the documentation that accompanied the machine:

1. Turn off each network station, disconnect any peripherals, and unplug power cords.

2. Remove the cover according to the manufacturer's instructions.

3. Loosen the screw on any empty expansion slot cover. Then pull out the expansion slot cover.

4. Insert the adapter into the slot, pressing it firmly into the expansion slot connector.

5. Tighten the expansion slot screw so that the adapter remains in place.

6. Replace the station's cover and tighten the cover screws.

Configuring the microchannel adapter

Before you configure the adapter, make sure you have a working copy of the *REFERENCE* (or similarly named) diskette. If you have not made a working copy of the diskette, do so before continuing with these instructions.

You must also have the @EFEF.ADF file. It should be on both the *REFERENCE* diskette and the option diskette that came with the adapter. Use the copy with the latest date.

To make settings on the IBM PC Network Adapter II/A you have installed, complete the following steps:

1. If necessary, copy the @EFEF.ADF file to the working copy of the *REFERENCE* (or similarly named) diskette. Consult the documentation that came with your microchannel architecture system.

2. Boot the station with its working copy of the *REFERENCE* diskette and follow the prompts.

3. Because you have added an adapter to the station, an error message appears. At the bottom of the screen, you are offered a choice to configure the system automatically. Select "N."

   Why not automatically configure the adapter? Some drivers must be configured to match the adapter settings. If you select a numbered option when you configure the operating system, you should specifically select the settings to ensure that the hardware and software settings match.

4. Select "Set configuration" and then "Change configuration."

5. Using the arrow keys, scroll through the settings on the screen, making sure that the screen settings match the settings you planned. Any information in brackets can be changed.

Newer IBM PS/2 machines (beginning with model 70 25Mhz 386 or 486) have a "Preempt" setting that defaults to enabled. You must disable "Preempt" using the REFERENCE program. Otherwise, the system bus hangs.

   If any setting is incorrect or conflicts with other settings in use, select another supported value. In this case, if you have already generated the software for the station, you must regenerate using the new settings. (ODI workstation drivers and v3.*x* file server drivers are not generated.) The REFERENCE program allows conflicts. NetWare does not.

6. When the settings are correct for this network station (file server, router, or workstation), save the changes and exit the configuration program.

Where to go from here

If you have set and installed all the adapters you plan to use on your broadband network, continue with "Cabling a broadband network" in the next section.

After planning the network layout, you configured the PC network adapters and installed an adapter in each network station. You are now ready to connect the network stations and other PC Network hardware with the appropriate broadband cabling by completing the following steps:

1. Place all network stations and other components in the locations you planned for them.

2. Run the appropriate lengths and types of broadband cables between network stations and components.

3. Connect all stations and components with network cables. Where necessary, remove terminators, leaving them on unused ports. Screw the cable connectors onto the threaded ports on the various network devices in a clockwise motion, tightening each one finger-tight.

4. Connect the transformer (for the translator unit) to an appropriate AC power source.

Where to go from here

Instructions for loading drivers are in the main NetWare manual or the manual that referred you to this supplement.

The new drivers (unlike the older NetWare v2.*x* PCN2 drivers) use the same frame format as that used by the IBM LAN Support Program.

The two frame formats are incompatible. Consequently, networks running NetWare v3.*x* or v2.*x* (using the new drivers) cannot communicate with NetWare v2.*x* networks that use the older PCN2 drivers with Novell frame format.

The next page offers possible solutions.

If you run NetWare v2.*x*

You have two options:

- Upgrade all drivers.

  You can use either dedicated IPX or ODI drivers for workstations. However, if you use dedicated IPX, you must also purchase the IBM LAN Support Program.

- Retain the older Novell frame format PCN2 drivers for file servers, routers (bridges), and workstations.

  You must use dedicated IPX for workstation files. You cannot communicate with networks using upgraded drivers.

If you run NetWare v3.*x*

You have two options:

- Upgrade all drivers.

  You can use either dedicated IPX or ODI drivers for workstations. However, if you use dedicated IPX, you must also purchase the IBM LAN Support Program.

- Retain the older Novell frame format PCN2 drivers for workstations and the workstation side of an external bridge (router).

Set up an external bridge with two PC network adapters. Use the driver that supports the Novell frame format on the workstation side of the bridge. Use the driver that supports IBM LAN Support frame format on the file server side of the bridge and on the file server.

If you plan to have workstations

Use Remote Reset. You have additional tasks to complete:

- **For DOS IPX workstations**

  Use DOSGEN to create a boot disk image file. Instructions for using DOSGEN are in *NetWare v3.11 Installation* and in *NetWare v2.2 Using the Network*.

- **For DOS ODI workstations**

  Include RPLODI.COM with the workstation files and add it to the AUTOEXEC.BAT file after LSL and before *drivername*. For further information, see "Managing DOS workstations" in *NetWare v2.2 Using the Network*.

  Then use DOSGEN to create a boot image file. Instructions for using DOSGEN are in *NetWare v3.11 Installation* and in *NetWare v2.2 Using the Network*.

If the workstations use IBM generic boot ROMs for Remote Reset

You must copy additional files to the file server:

- **For NetWare v2.*x* file servers**

  Copy PCN2.RPL or PCN2L.RPL (whichever matches the driver you use) to SYS:SYSTEM. For instructions on loading VAPs, see *NetWare v2.2 Using the Network*.

- **For NetWare v3.*x* file servers**

  Copy PCN2RPL.NLM (IBM LAN Support Program frame compatible) to SYS:SYSTEM. Then bind it to the appropriate LAN driver. For information on PCN2RPL.NLM, refer to *NetWare v3.11 System Administration*.

If you are using the IBM LAN Support Program

Consult the documentation that accompanies the program for instructions. For an example of copying LAN SUPPORT PROGRAM files to a Token-Ring boot diskette, see "Booting Token-Ring workstations" in the *NetWare Installation Supplement for IBM Token-Ring*.

Section 2: The IBM PC baseband network

This section provides an overview of the hardware and cable requirements for a baseband IBM PC network. It also explains how to design a network layout and how to set and install IBM PC network adapters.

Topic	Page
Overview of the IBM PC baseband network	34
Baseband network hardware	35
Basic baseband network distances	37
Expanding the basic baseband network	38
Planning the network layout	39
Configuring baseband adapters	42
IBM PC Network Baseband Adapter	44
IBM PC Network Baseband Adapter/A	51
Cabling a baseband network	58

Note: Baseband and broadband hardware cannot be used on the same network. However, you can use a router (bridge) to connect a baseband network and a broadband network.

The new drivers (unlike the older NetWare v2.*x* PCN2 drivers) use the same frame format as that used by the IBM LAN Support Program. The two frame formats are incompatible. Consequently, networks using the new IBM LAN Support Program-compatible drivers cannot communicate with NetWare v2.*x* networks that use the older PCN2 drivers with Novell frame format. See page 59 for possible solutions.

Figure 2.1 shows a basic baseband PC network that supports from two to eight daisy-chained stations. Network stations are cabled together with twisted pair cable. The maximum distance between the first and the last station varies between 200 and 300 feet, depending on the number of stations.

A basic network can be expanded by using a device called a baseband extender. You can increase the number of stations to 80 and also extend the cable distances. Stations must be within 500-650 feet of the baseband extender. (Page 38 provides more information on baseband extenders.)

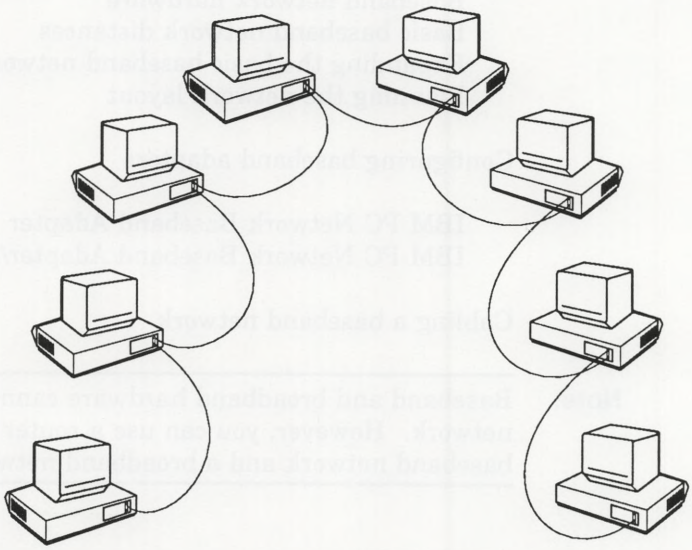

Figure 2.1
Basic baseband IBM PC Network

Baseband network hardware

The hardware needed to set up an IBM PC baseband network is described in this section and illustrated in Figure 2.2.

Cable

A baseband network requires twisted-pair cabling, which consists of two wires twisted together and sealed inside an insulated coating.

Cabling is available in 25-foot lengths. If you need longer lengths of cable, you can join several lengths of cable by using modular couplers (described below), or you can buy a spool of cable, cut the cable to suitable lengths, and attach connectors to the ends of the cable lengths yourself.

Note: Although baseband network cabling and telephone cabling are similar, the IBM baseband PC network uses 8-conductor connectors and couplers while typical telephone wiring uses 4-conductor connectors and couplers.

See the documentation that accompanied the adapters for additional information on cabling.

Modular connectors and couplers

Modular connectors are attached to both ends of baseband cable lengths; modular couplers are used to join baseband cable lengths.

Wrap plug

A wrap plug (black) allows network signals traveling to one end of the network cable to continue back down the second of the two twisted wires inside the cable. Only one wrap plug is used for a network.

Terminator plug

Terminator plugs (clear) ensure that network transmissions do not "bounce" back down the network cable to interfere with other transmissions.

PC network adapters

PC network adapters are network interface boards. PC network adapters installed in each network station and cabled together allow network stations to communicate. Two PC network adapters are available for use on IBM PC baseband networks. (See Figure 2.2.)

- IBM PC Network Baseband Adapter for use in ISA machines
- IBM PC Network Baseband Adapter/A for use in microchannel machines

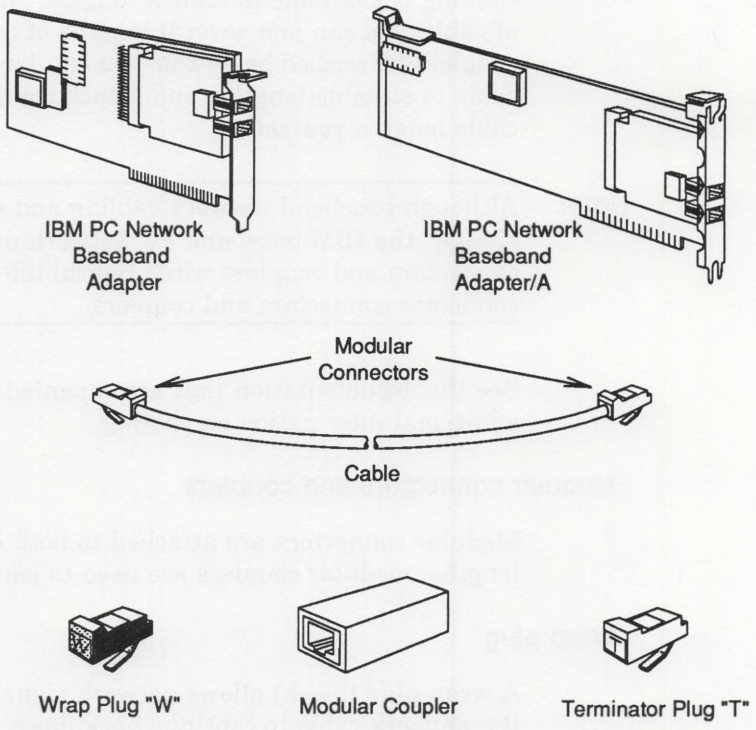

Figure 2.2
Baseband network hardware

Basic baseband network distances

The basic baseband network supports from two to eight stations and is limited in total network cable length, determined by the number of stations. As the number of stations on the network increases, the total network cable length decreases.

For example, if you plan to make a two-station network, the maximum cable length between the two stations is 300 feet. When you add a station, the maximum distance between the first and the last station decreases to 275 feet. The maximum distance is important; the distance between each station can vary according to your needs.

The relationship between the number of stations and total network cable length is summarized in the following table:

Number of Stations	Maximum Cable Distance
2	300 ft. total
3	275 ft. total
4	250 ft. total
5	225 ft. total
6	225 ft. total
7	200 ft. total
8	200 ft. total

If you plan to limit your network to a maximum of eight stations (a basic baseband network), skip to page 39, "Baseband rules and limitations."

Although a basic baseband network is limited to eight stations and maximum cable lengths are restricted, you can increase the number of network stations and create a larger network by connecting additional chains of network stations to a baseband extender.

A baseband extender allows you to connect as many as 10 separate chains of 8 stations for a total of 80 network stations. Each chain can use the maximum distance, whether the chain has one station or eight stations.

Figure 2.3 shows how a baseband extender is used. The baseband extender has two identical "OUT" ports. Terminator plugs are used in one "OUT" port and in the last station of each chain. One wrap plug is used in the other "OUT" port of the baseband extender.

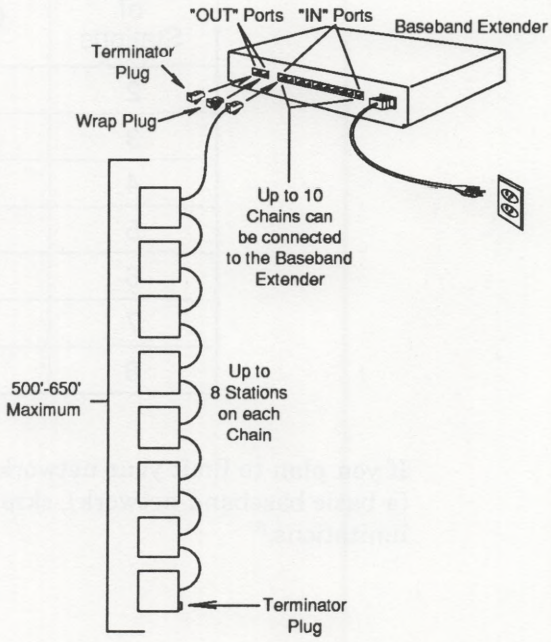

Figure 2.3
Extended baseband PC network

Planning the network layout

Before you consider your specific network needs, review the following summary of the limitations and rules that apply to basic and extended baseband PC networks. (See also Figure 2.4.)

Baseband rules and limitations

The following guidelines govern baseband PC networks:

Basic baseband network

- Maximum number of stations: 8
- Maximum cable lengths: See chart on page 37.
- One end of the network must be terminated with an 8-conductor terminator plug.
- A wrap plug must be installed in the station on the other end of the network (the end opposite the terminator plug).

Extended baseband network

- Maximum number of stations: 80
- Maximum cable length for each chain of stations: 500-650 feet
- One end of each chain of stations must be terminated with an 8-conductor terminator plug.
- The other end of each chain of stations must be inserted into one of the "IN" ports on the baseband extender.
- One wrap plug and one terminator plug must be inserted into the two "OUT" ports on the baseband extender.

For either network, be careful not to crimp the cable, damage its insulation, or run it near heat sources or in heavy traffic areas where hand trucks or rolling chairs might damage it.

For additional information, consult the *IBM PC Network Baseband Planning Guide.*

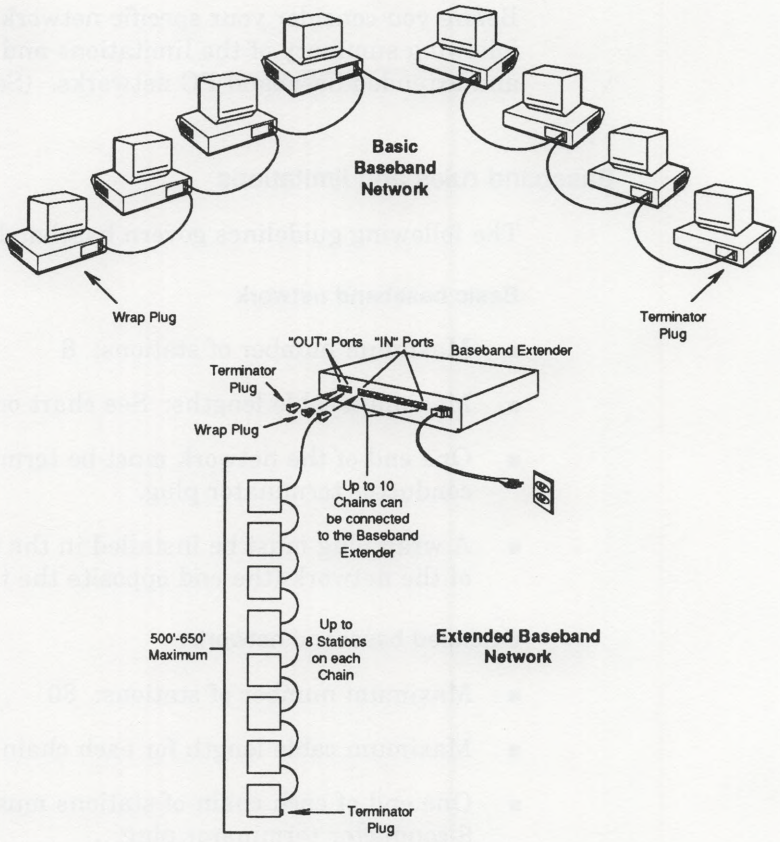

Figure 2.4
Basic and extended IBM PC baseband networks

Additional planning considerations

Define your particular network needs by considering the following questions:

- How large an area must the cabling system cover?
- How many stations–servers, routers (bridges), and workstations–are to be connected to the cabling system?
- How far apart are the stations to be?
- What potential growth in size and connections must the system accommodate?

Then, keeping in mind the guidelines given on page 39, make a diagram of your network plan:

- Label each piece of hardware.
- Label the type of PC adapter used in each station.
- Measure the distances between all components and make sure that they do not exceed the maximums. Record these distances on the diagram.
- Make sure that the locations you choose for file servers have adequate room for any peripherals (such as printers and external disk drives) to be attached.

When you have completed the diagram, continue with the next section to configure the adapters.

Configuring baseband adapters

To simplify network setup and administration, record the configuration information for each adapter on a string tag, an adhesive label, or some other form of identification attached to the adapter.

Refer to the following items:

- The diagram of the network layout you were advised to make
- The worksheets you filled out in the main NetWare installation manual either when you planned or configured the server operating system and router software, or when you set the LAN driver for each workstation

Label each board with the following information:

- **Type of station.** The type of station into which the adapter is to be inserted may be a workstation, router, NetWare v2.*x* file server, or NetWare v3.*x* file server.
- **Specific network station.** The specific network station in which the adapter is to be installed is identified by its intended physical location or user.
- **Adapter type.** The primary (default) adapter is the first or only IBM PC network baseband adapter installed. You can install an alternate adapter only as a second adapter in a file server, router (bridge), or ODI workstation.

  If you install two adapters in a station and one of the adapters is physically shorter than the other, the shorter one must be the primary adapter.
- **ROM BIOS.** ROM BIOS must be either enabled or disabled for all adapters. Enable ROM BIOS on the primary adapter. It should be disabled for the alternate adapter.

- **Remote Reset.** Although using the Remote Reset feature to allow workstations to boot from a network (file server) hard disk (instead of a local drive) is optional, Remote Reset must be either enabled or disabled for all adapters. Only the primary adapter can use Remote Reset. (Adapters come with a boot PROM already installed.)

Note: Only microchannel machines without hard disks can use the Remote Reset feature. You must also remove the boot diskette from the floppy disk drive.

- **Configuration option.** Record this later after reading "Default settings" and "Planning the configuration option" on page 42.

If you plan to use the IBM PC Network Baseband Adapter for ISA machines, continue with "IBM PC Network Baseband Adapters" in the following section.

If you plan to use the IBM PC Network Baseband Adapter/A for microchannel machines, skip to page 51 for instructions on installing and setting microchannel adapters.

IBM PC Network Baseband Adapter (ISA)

This section explains how to set and install the IBM PC Network Baseband Adapter. The adapter can be inserted in ISA file servers, routers (bridges), or workstations.

Note: Only one adapter (designated as "primary") can be installed in dedicated DOS IPX workstations. However, ODI workstations, file servers, and routers can use both a primary adapter and an "alternate" adapter.

If you install two adapters in a station and one of the adapters is physically shorter than the other, the shorter one must be the primary adapter.

The adapter can also be inserted in an ISA slot in EISA machines.

Default settings

The IBM PC Network Baseband Adapter is factory set to the following defaults:

- Configuration option 0
  - IRQ2
  - Base I/O address: 620h (Primary)
  - Base memory address: CC000h
- ROM BIOS enabled (Primary, uses memory D0000h-D7FFFh)
- Remote Reset disabled

Planning the configuration option

The configuration option includes the interrupt request line, base I/O address, and base memory address.

The base I/O address determines the adapter type, primary or alternate. The adapter type, in turn, determines whether ROM BIOS must be enabled or disabled.

Make sure that the interrupt, base I/O address, and base memory address you choose for the adapter are unique; no other boards (including a PC network adapter) or hardware should use conflicting settings. If you have a hardware conflict, you must choose another option for the conflicting adapter.

For DOS IPX workstations, you must select the same numbered configuration option when you generate and set the LAN driver in IPX.COM. The adapter and LAN driver settings must match.

Note: ODI drivers for the workstations do not use numbered configuration options. If you have a hardware conflict, you only need to reset the adapter and then specify the interrupt, base I/O address, and base memory address in the NET.CFG file. For further information, see *NetWare ODI Shell for DOS.*

Determine the configuration for each adapter, using the information in Figure 2.5, and record the configuration information for each adapter on the attached tag or label.

Note: When you use like workstation adapters, you can simplify creating workstation files and master workstation diskettes by using the same configuration for each workstation adapter (as long as none of the stations has devices that require conflicting settings).

For primary workstation adapters

Refer to Figure 2.5.

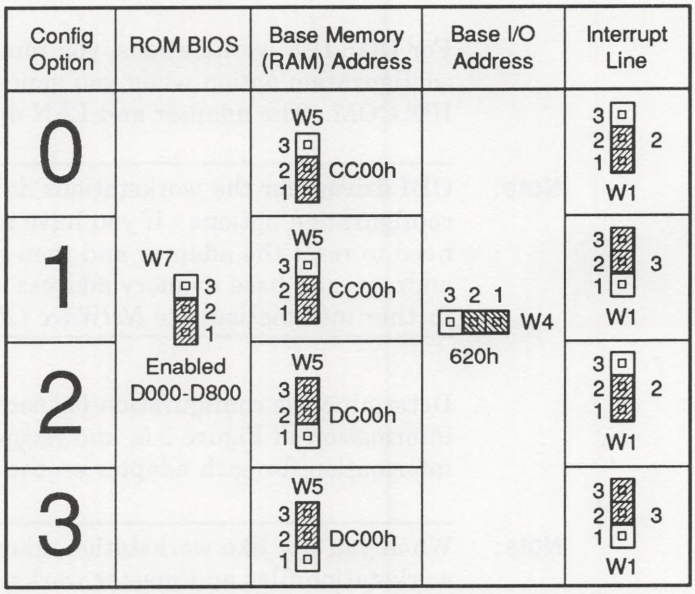

Figure 2.5
Configuration options for baseband primary adapters in workstations

For alternate workstation adapters (the second adapter in an ODI workstation)

Refer to Figure 2.6. Make sure the settings you choose for the interrupt line and the base memory address do not conflict with the values set for the primary adapter.

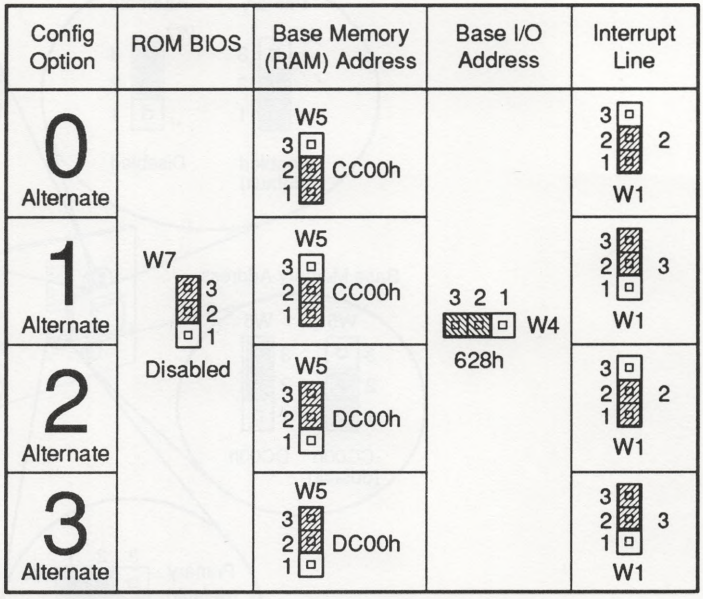

Figure 2.6
Configuration options for baseband alternate adapters in workstations

For primary server or router adapters

Use any supported value shown in Figure 2.5, but use default settings where possible. Make sure the interrupt line and the base memory address settings do not conflict with the values set for the alternate adapter.

For alternate server or router adapters

Use option 0 settings shown in Figure 2.6 where possible, but you can use any supported value. Make sure the interrupt line and the base memory address settings do not conflict with the values you set for the alternate adapter.

Configuring the adapter

To determine the location of the components used to set IBM PC Network Baseband Adapter, refer to Figure 2.7.

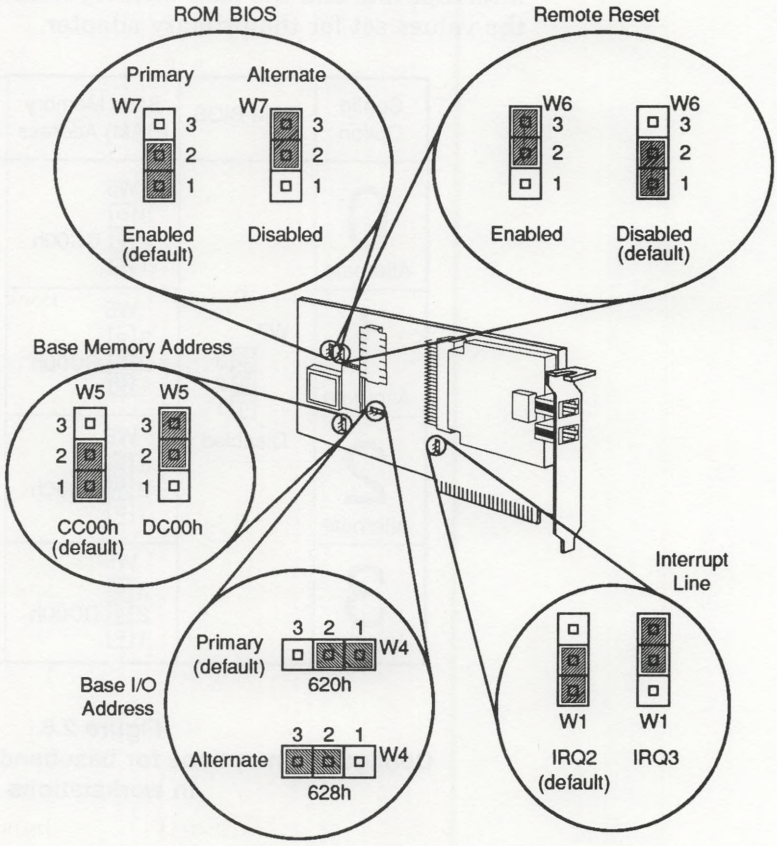

Figure 2.7
Location of components used in setting an IBM PC Network Baseband Adapter

Set each adapter by completing the following steps:

1. Refer to Figure 2.7 to locate the components used to set the adapter and the position of the jumpers for each setting.

2. Identify the settings you plan to use by checking the tag or label you attached to each IBM PC Network Baseband Adapter.

3. According to the adapter type, set the base I/O address and enable/disable ROM BIOS.
   - For base I/O address, use jumper block W4.
   - For ROM BIOS, use jumper block W7.
     - For primary adapters, base I/O address=620h and ROM BIOS is enabled (uses memory address D0000h-D7FFFh).
     - For alternate adapters, base I/O address=627h and ROM BIOS is disabled.

4. Set a unique interrupt line and base memory address for each PC network adapter in a machine.
   - For IRQ, use jumper block W1.
   - For base memory address, use jumper block W5.

5. Using Figure 2.7, locate jumper block W6 and then do one of the following (according to your plans):
   - Enable Remote Reset on adapters for all NetWare v2.*x* workstations that are going to boot from the file server's hard disk.
   - Disable Remote Reset on all other adapters.

Note: Before you can use Remote Reset, you must also load the appropriate .RPL file (matches the driver) in the SYS:SYSTEM directory on the file server and reboot the server.

Installing the adapter

To install an IBM PC Network Baseband Adapter in a network station, complete the following steps using the documentation that accompanied the machine:

1. Turn off each network station, disconnect any peripherals, and unplug power cords.
2. Remove the cover according to the manufacturer's instructions.
3. Remove the metal dummy bracket from an open slot in each station.
4. Insert each adapter into the appropriate station, pressing it completely into the expansion slot connector.
5. Replace the station's cover.

Where to go from here

If you have set and installed all the adapters you plan to use on your baseband network, turn to "Cabling a baseband network" on page 54.

If your baseband network also includes microchannel machines, continue with the instructions in the following section for setting the IBM PC Network Baseband Adapter/A.

IBM PC Network Baseband Adapter/A (MCA)

This section explains how to install and set the IBM PC Network Baseband Adapter/A.

The adapter can be inserted in microchannel file servers, routers (bridges), and workstations. Only one adapter (designated as "primary") can be installed in a dedicated DOS IPX workstation. However, ODI workstations, file servers, and routers can use both a primary and an "alternate" adapter.

The IBM PC Network Baseband Adapter/A is configured by software after the board is inserted into the network station.

Default settings

The IBM PC Network Baseband Adapter A must be configured with the *REFERENCE* (or similarly-named) diskette.

The first or only adapter in a machine is designated as primary. Only a primary adapter can use Remote Reset. Selecting an RPL setting for a PC network adapter (in a diskless microchannel workstation) makes it the primary adapter as well.

The second adapter in a machine is designated as alternate.

For other resources, select any supported value (as long it does not conflict with settings required by any other board or device).

Newer IBM PS/2 machines (beginning with model 70 25Mhz 386 or 486) have a "Preempt" setting that defaults to enabled. Use the REFERENCE program to disable "Preempt." Otherwise, the system bus hangs.

Planning the configuration option

The configuration option includes the following:

- **Adapter type**

  Primary, alternate, or RPL (a primary adapter that uses Remote Reset)

  - Primary and RPL use base I/O=620h-627h and enable ROM BIOS (memory address D0000h-D7FFFh).

  - Alternate uses base I/O=628h-62F and disables ROM BIOS.

- **Base memory (RAM) address**

  Mem 1 (CE000h-CFFFFh), Mem 2 (D6000h-D7FFFh), and Mem 3 (DE000h-DFFFFh)

- **Interrupt line**

  Int 2 (IRQ2) and Int 3 (IRQ3)

Make sure the interrupt, base I/O address, and base memory address you choose for the adapter are unique; no other boards (including a PC network adapter) or hardware should use conflicting settings. If you have a hardware conflict, you must choose another option for the conflicting adapter.

For DOS IPX workstations, you must select the same configuration option when you set the LAN driver in IPX.COM file. The adapter and LAN driver settings must match.

Note: ODI drivers for the workstations do not use numbered configuration options. If you have a hardware conflict, you only need to reset the adapter and then specify the interrupt, base I/O address, and base memory address in the NET.CFG file. For further information, see *NetWare ODI Shell for DOS*.

Note: When you use like adapters in workstations, you can simplify creating workstation files and master workstation diskettes by using the same configuration for each workstation adapter (as long as none of the stations has devices that require conflicting settings).

Determine the configuration for each adapter, using the information on the following pages, and record the configuration information for each adapter on the attached tag or label.

For primary workstation adapters

Use the following table. The Remote Reset settings are found on page 54. (The only difference is that you select "RPL" rather than "Primary.")

Note: If you plan to have an alternate adapter in the same machine, use Int 2.

Option	Type	Memory Location	Interrupt Level
4	Primary	Mem 1	Int 2
5	Primary	Mem 2	Int 2
6	Primary	Mem 3	Int 2
7	Primary	Mem 1	Int 3
8	Primary	Mem 2	Int 3
9	Primary	Mem 3	Int 3

For Remote Reset for a primary adapter in a diskless microchannel workstation

Use the following table:

Note: If you plan to have an alternate adapter in the same machine, use Int 2.

Type	Memory Location	Interrupt Level
RPL	Mem 1	Int 2
RPL	Mem 2	Int 2
RPL	Mem 3	Int 2
RPL	Mem 1	Int 3
RPL	Mem 2	Int 3
RPL	Mem 3	Int 3

For alternate workstation adapters (the second adapter in an ODI workstation)

Use the following table:

Type	Memory Location	Interrupt Level
Alternate	Mem 1	Int 3
Alternate	Mem 2	Int 3
Alternate	Mem 3	Int 3

For primary server or router adapters

Use the following table.

Note: If you plan to have an alternate adapter in the same machine, use Int 2.

Type	Memory Location	Interrupt Level
Primary	Mem 1	Int 2
Primary	Mem 2	Int 2
Primary	Mem 3	Int 2
Primary	Mem 1	Int 3
Primary	Mem 2	Int 3
Primary	Mem 3	Int 3

For alternate server or router adapters

Use the following table.

Type	Memory Location	Interrupt Level
Alternate	Mem 1	Int 3
Alternate	Mem 2	Int 3
Alternate	Mem 3	Int 3

Installing the microchannel adapter

To insert an IBM PC Network Baseband Adapter/A in a microchannel machine, complete the following steps using the documentation that accompanied the machine:

1. Turn off each network station, disconnect any peripherals, and unplug power cords.

2. Remove the cover according to the manufacturer's instructions.

3. Loosen the screw on any empty expansion slot cover. Then pull out the expansion slot cover.

4. Insert the adapter into the slot, pressing it firmly into the expansion slot connector.

5. Tighten the expansion slot screw so that the adapter remains in place.

6. Replace the station's cover and tighten the cover screws.

Setting the microchannel adapter

Before you set the adapter, make sure you have a working copy of the *REFERENCE* (or similarly-named) diskette. If you have not made a working copy of the diskette, do so before continuing with these instructions.

You must also have the @EFEF.ADF file. It should be on both the *REFERENCE* diskette and the option diskette that came with the adapter. Use the copy with the latest date.

To make settings on the IBM PC Network Baseband Adapter/A you have installed, complete the following steps:

1. If necessary, copy the @EFEF.ADF file to the working copy of the *REFERENCE* (or similarly named) diskette. Consult the documentation that came with your microchannel architecture system.

2. Boot the station with its working copy of the *REFERENCE* diskette and follow the prompts.

3. Because you have added an adapter to the station, an error message appears. At the bottom of the screen, you are offered a choice to configure the system automatically. Select "N."

   Why not automatically configure the adapter? Some drivers must be configured to match the adapter settings. If you select a numbered option when you configure the operating system, you should specifically select the settings to ensure

that the hardware and software settings match.

4. Select "Set configuration" and then "Change configuration."

5. Using the arrow keys, scroll through the settings on the screen, making sure that the screen settings match the settings you planned. Any information in brackets can be changed.

Newer IBM PS/2 machines (beginning with model 70 25Mhz 386 or 486) have a "Preempt" setting that defaults to enabled. You must disable "Preempt" using the REFERENCE program. Otherwise, the system bus hangs.

If any setting is incorrect or conflicts with other settings in use, select another supported value. In this case, if you have already generated the software for the station, you must regenerate using the new settings. (ODI workstation drivers and v3.*x* file server drivers are not generated.) The REFERENCE program allows conflicts. NetWare does not.

6. When the settings are correct for this network station (file server, router, or workstation), save the changes and exit the configuration program.

Where to go from here

If you have set and installed all the adapters you plan to use on your baseband network, continue with "Cabling a baseband network" on page 58.

Cabling a baseband network

After planning the network layout, you configured the PC network baseband adapters and installed an adapter in each network station. You are now ready to connect the network stations and other PC Network hardware with the appropriate baseband cabling by completing the following steps:

1. Place all network stations and other components in the locations you planned for them.
2. Run the appropriate lengths and types of baseband cables between network stations and components.
3. Connect all stations and components with network cables.
4. Install the terminator plug and wrap the plug at the appropriate locations.

   - **If you are building a basic baseband network**

     Locate the two stations on the ends of the network. (Note that the metal brackets attached to the baseband adapters installed in these two stations both have one empty socket where another cable can be attached.) Insert a terminator plug into the empty socket on one of these stations and a wrap plug into the empty socket on the other station.

   - **If you are building an extended network**

     Insert one terminator plug and one wrap plug into the two "OUT" ports on the baseband extender. Then locate the last station on each chain of stations (the one on each chain farthest from the baseband extender). Note that the metal bracket on the baseband adapter in each of these stations has one empty socket. Insert a terminator plug into each of these empty sockets so that the end of each series of stations is terminated. Finally, connect the baseband extender to an appropriate AC power source.

Where to go from here

Instructions for loading drivers are in the main NetWare manual or the manual that referred you to this supplement.

The new drivers (unlike the older NetWare v2.*x* PCN2 drivers) use the same frame format as that used by the IBM LAN Support Program. The two frame formats are incompatible. Consequently, networks running NetWare v3.*x* or v2.*x* (using the new drivers) cannot communicate with NetWare v2.*x* networks that use the older PCN2 drivers with Novell frame format.

The following are possible solutions:

If you run NetWare v2.*x*

You have two options:

- Upgrade all drivers.

  You can use either dedicated IPX or ODI drivers for workstations. However, if you use dedicated IPX, you must also purchase the IBM LAN Support Program.

- Retain the older Novell frame format PCN2 drivers for file servers, routers (bridges), and workstations.

  You must use dedicated IPX for workstation files. You cannot communicate with networks using upgraded drivers.

If you run NetWare v3.*x*

You must upgrade all drivers.

If you plan to have workstations

Use Remote Reset. You have additional tasks to complete:

- **For DOS IPX workstations**, use DOSGEN to create a boot disk image file. Instructions for using DOSGEN are in *NetWare v3.11 Installation* and in v2.x *Using the Network*.

- **For ODI workstations,** include the RPLODI.COM file in the workstation files and in AUTOEXEC.BAT. Instructions are in *NetWare ODI Shell for DOS* and in v2.x *Using the Network*.

- **For NetWare v2.*x* file servers,** copy either PCN2.RPL or PCN2L.RPL (whichever matches the driver you use) to SYS:SYSTEM.

- **For NetWare v3.*x* file servers,** use the LOAD command to load either PCN2RPL.NLM or PCN2LRPL.NLM (whichever matches the server driver you use). You can also include the LOAD command in the AUTOEXEC.NCF file.

If you are using the IBM LAN Support Program

Consult the documentation that accompanies the program for instructions. For an example of copying LAN SUPPORT PROGRAM files to a Token-Ring boot diskette, see "Booting Token-Ring workstations" in the *NetWare Installation Supplement for IBM Token-Ring*.

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How to use this manual

This manual explains how to install 3Com EtherLink networking hardware on a NetWare network. It is a supplement to several main NetWare manuals.

If you have not already done so, read and follow the instructions in your main NetWare manual up to the point where it advises you to consult this supplement.

Manual organization

This manual includes the following three sections:

Section 1: Planning your network

Reviews the four types of Ethernet cable networks listed below, their associated network hardware, and rules and guidelines for using each cabling type. It also explains how to plan your own network and how to prepare and install the networking hardware.

- Thin Ethernet cable
- Thick Ethernet cable
- Combination thin/thick Ethernet cable
- Twisted pair Ethernet cable

Section 2: Configuring 3Com EtherLink boards

Gives instructions for configuring and installing the following EtherLink network boards in standard-bus and microchannel architecture machines used as workstations, routers, and file servers.

- EtherLink 3C501 (Assy. #1221)
- EtherLink Plus 3C505 (Assy. #1194)
- EtherLink Plus 3C505 (Assy. #2012)
- EtherLink II 3C503 (Assy. #2227)
- EtherLink II TP 3C503 (Assy. #6330)
- EtherLink/MC 3C523 (Assy. #4233)
- EtherLink/MC TP 3C523 (Assy. #6852)

Section 3

Gives instructions for cabling four types of Ethernet networks:

- Thin Ethernet cabling
- Thick Ethernet cabling
- Thin/thick Ethernet cabling
- Twisted pair Ethernet cabling

Other manuals

For information on loading LAN drivers for NetWare v3.*x* file servers, see the "LOAD LAN Driver" section of *NetWare 3.11 System Administration*. For information on linking LAN drivers for NetWare v2.*x*, see "The linking and configuring module" in the Installation section of *Installing and Maintaining the Network*.

Note: All references to routers in this manual also apply to bridges.

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Section 1: Planning the network

Three kinds of Ethernet cables are used in Ethernet networks:

- Thin Ethernet cable or thin cable
- Thick Ethernet cable, thick cable, or standard Ethernet cable
- Twisted pair Ethernet cable

These three kinds of Ethernet cable build four kinds of Ethernet networks: thin cable networks, thick cable networks, combination thin/thick cable networks, and twisted pair networks.

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Network stations can be file servers, routers, or workstations. Stations are connected at intervals to one long main cable, the *trunk segment cable*. The network stations and the main cable together form a *trunk segment*. (See Figure 1.1.)

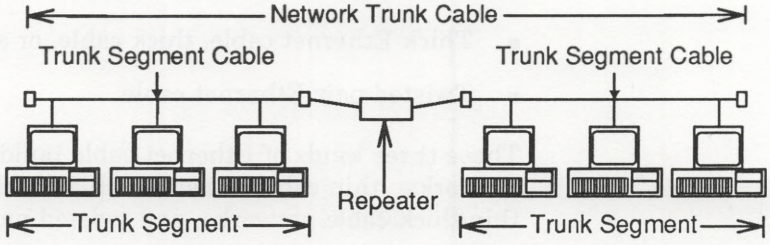


Figure 1.1
Parts of an Ethernet network

The trunk segment is limited. It has both a maximum length and a maximum number of stations. However, a network can be expanded beyond one trunk segment by linking two or more trunk segments together with a *repeater*. (See Figure 1.2.) A repeater strengthens network signals and forms a passageway for network signals traveling from one trunk segment to another.

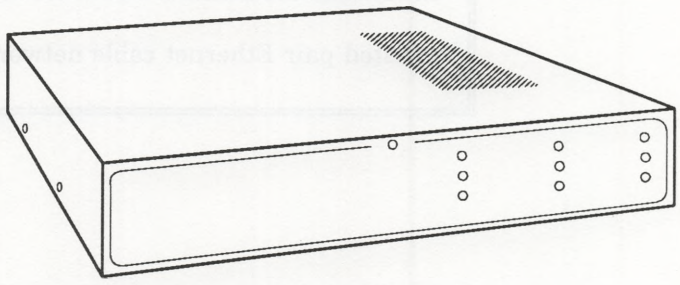


Figure 1.2
A repeater

The *network trunk cable* is the sum of all the trunk segment cables. Just as a trunk segment cable is the backbone of a trunk segment, the network trunk cable is the backbone of the entire network.

Thin Ethernet cable networks

This section describes the hardware and typical cabling layout for a thin Ethernet network.

Hardware for thin Ethernet cable networks

The hardware needed to set up a thin Ethernet cable network is described in this section and illustrated in Figure 1.3 on page 4.

Network board

The network board, a printed circuit board, is installed into each network station (including servers, routers, and workstations). The board's mounting bracket allows for thin or thick cabling.

BNC connectors

BNC jacks and plugs connect network hardware.

Thin Ethernet cable

Thin Ethernet cable is 0.2-inch RG-58A/U 50-ohm coaxial cable.

BNC barrel connectors

BNC barrel connectors join two lengths of thin Ethernet cable.

BNC T-connectors

The two opposing jacks of the T-connector act as a barrel connector and join two lengths of thin Ethernet cable. The remaining plug attaches to the BNC connector jack on a network board installed in a network station.

BNC terminator

A BNC 50-ohm terminator "terminates" the network and blocks electrical interference on the network. Some BNC terminators come with a grounding wire attached.

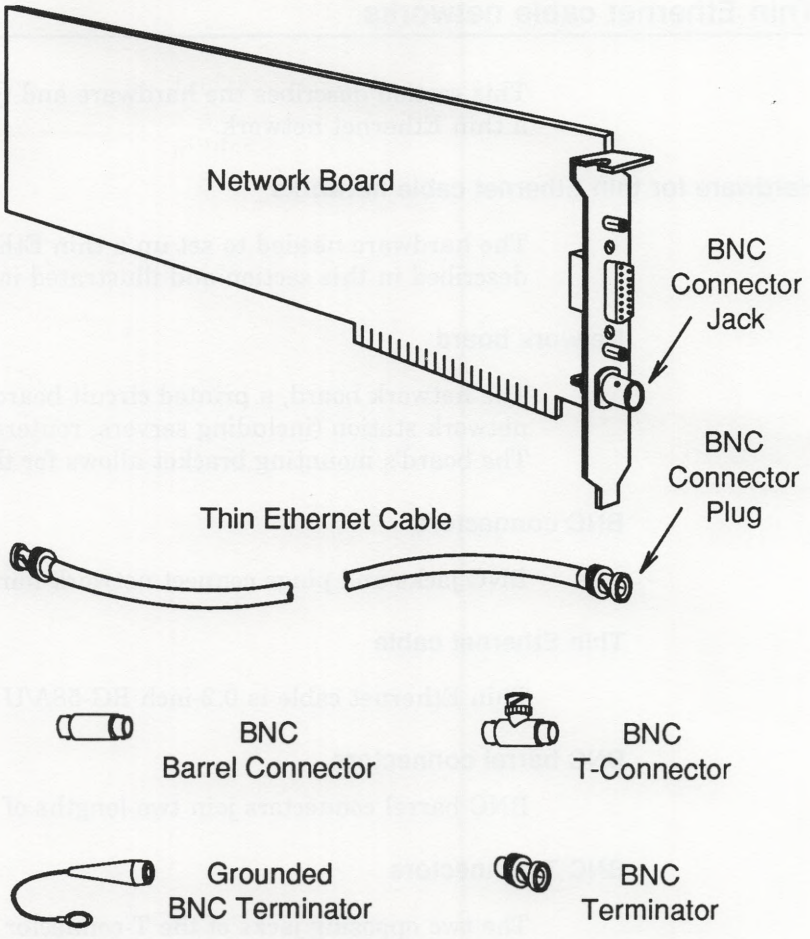


Figure 1.3
Hardware for thin Ethernet cable networks

Thin Ethernet cable network layout

Below is a summary of the limitations and rules pertaining to a thin Ethernet cable network. Figure 1.4 on page 6 illustrates a typical thin Ethernet cabling layout.

Limitations

The following limitations apply to a thin Ethernet cable network:

- Maximum number of trunk segments: 5
- Maximum trunk segment length: 987 feet (300 meters)
- Maximum network trunk cable length: 4,935 feet (1,500 meters)
- Maximum number of stations connected to one trunk segment: 100 (Repeaters count as one station on each trunk segment.)
- Minimum distance between BNC T-connectors: 3 feet (1 meter)

Rules

The following rules govern a thin Ethernet cable network:

- Attach a BNC terminator to each end of each trunk segment. One of the two terminators on each segment must be grounded.
- Keep barrel connector splices to a minimum. Use unspliced cable lengths between network stations wherever possible. The fewer connections you make in your cable, the more reliable the network will be.

If you are sure you will never require a network trunk cable over 4,935 feet (1,500 meters) long, you will probably want to use thin Ethernet cable, since this type of cable is less expensive and easier to install than thick Ethernet cable.

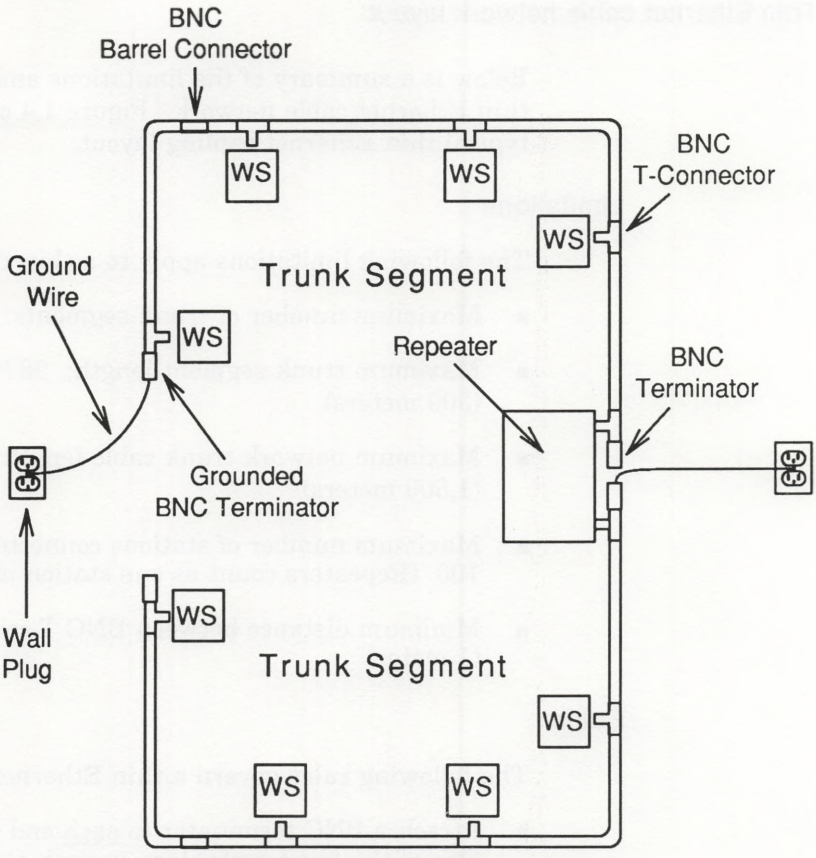


Figure 1.4
Typical layout of a thin Ethernet cable network

Thick Ethernet cable networks

This section describes the hardware and typical cabling layout for a thick Ethernet network.

Hardware for thick Ethernet cable networks

This section describes the hardware needed to set up a thick Ethernet cable network. Each piece is illustrated in either Figure 1.5 on page 8 or Figure 1.6 on page 9.

Network board

The network board, a printed circuit board, is installed into each network station (including servers, routers, and workstations). The board's mounting bracket allows for thin or thick cabling.

Transceiver

Any standard Ethernet-style (IEEE 802.3) external transceiver can be used on a thick cable network.

Transceiver cable

The transceiver cable connects stations to external transceivers on a thick cable Ethernet network.

DIX connectors

A DIX plug and a DIX socket are attached to either end of the transceiver cable.

Adapter plate

An adapter plate secures the connection between a transceiver cable and a network board installed in a station.

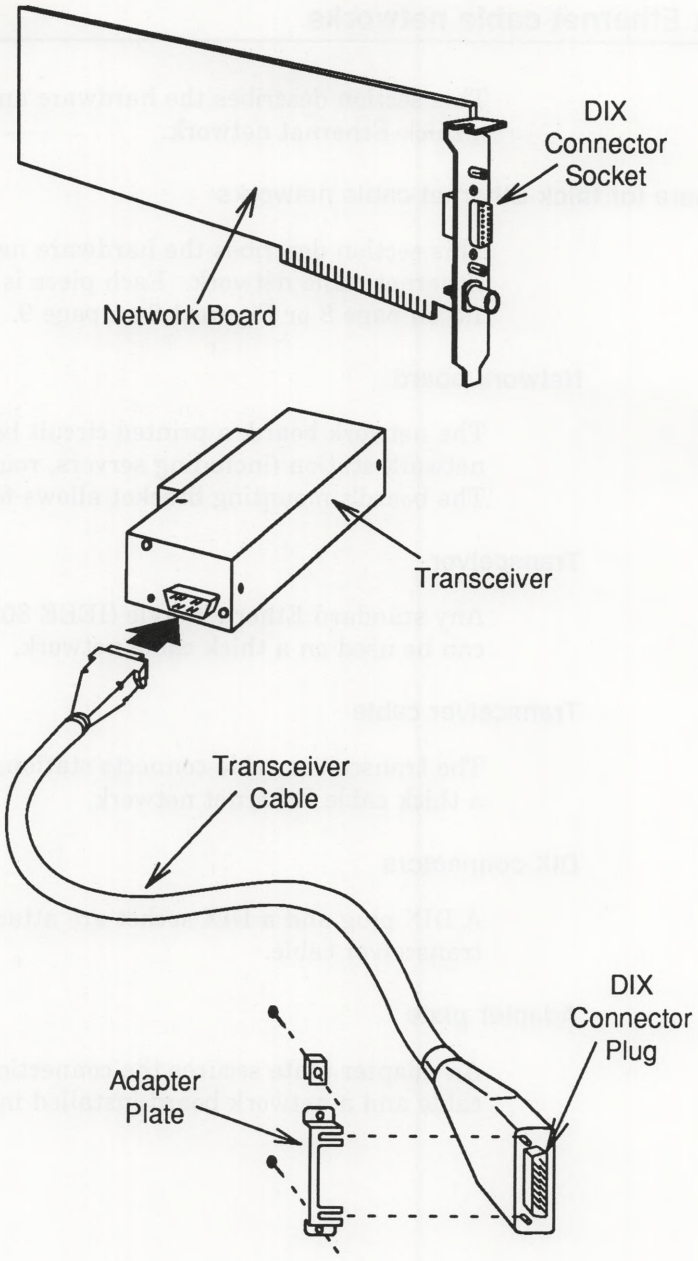


Figure 1.5
Hardware for thick Ethernet cable networks

Thick Ethernet cable

Thick Ethernet cable is 0.4-inch diameter, 50-ohm coaxial cable.

N-Series barrel connectors

N-series barrel connectors join two lengths of thick Ethernet cable.

N-Series terminators

N-series 50-ohm terminators "terminate" the network and block electrical interference. Some terminators also ground the network; these terminators have grounding wire and should be attached on only one end of each cable segment.

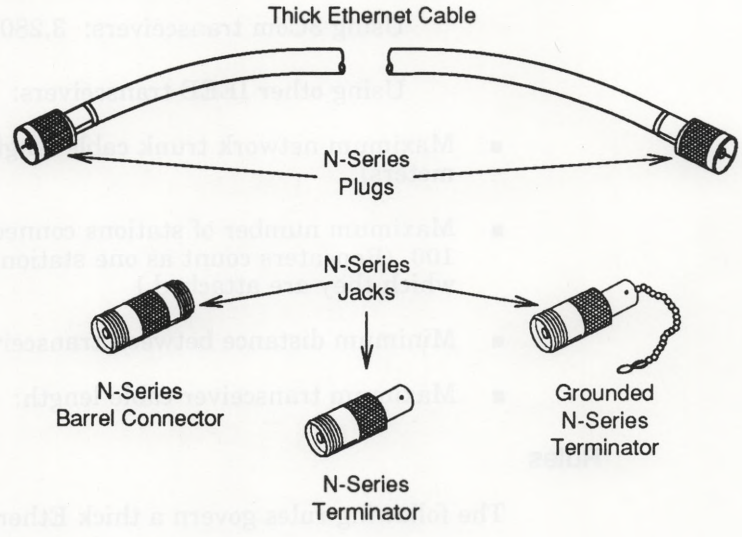


Figure 1.6
Thick Ethernet cabling, connectors, and terminators

Thick Ethernet cable network layout

The following is a summary of the limitations and rules pertaining to a thick Ethernet cable network. Figure 1.7 on page 11 illustrates a typical thick Ethernet cable layout.

Limitations

The following limitations apply to thick Ethernet cable networks:

- Maximum number of trunk segments: 5 (three of which may have stations or file servers attached)
- Maximum trunk segment length:

  Using 3Com transceivers: 3,280 feet (1,000 meters)

  Using other IEEE transceivers: 1,640 feet (500 meters)
- Maximum network trunk cable length: 8,200 feet (2,500 meters)
- Maximum number of stations connected to one trunk segment: 100 (Repeaters count as one station on each trunk segment to which they are attached.)
- Minimum distance between transceivers: 8 feet (2.5 meters)
- Maximum transceiver cable length: 165 feet (50 meters)

Rules

The following rules govern a thick Ethernet cable network:

- Attach an N-series terminator to each end of each trunk segment. One of the two terminators on each segment must be grounded.
- Keep barrel connector splices to a minimum. Use unspliced cable lengths between network stations wherever possible. The fewer connections you make in your cable, the more reliable the network will be.

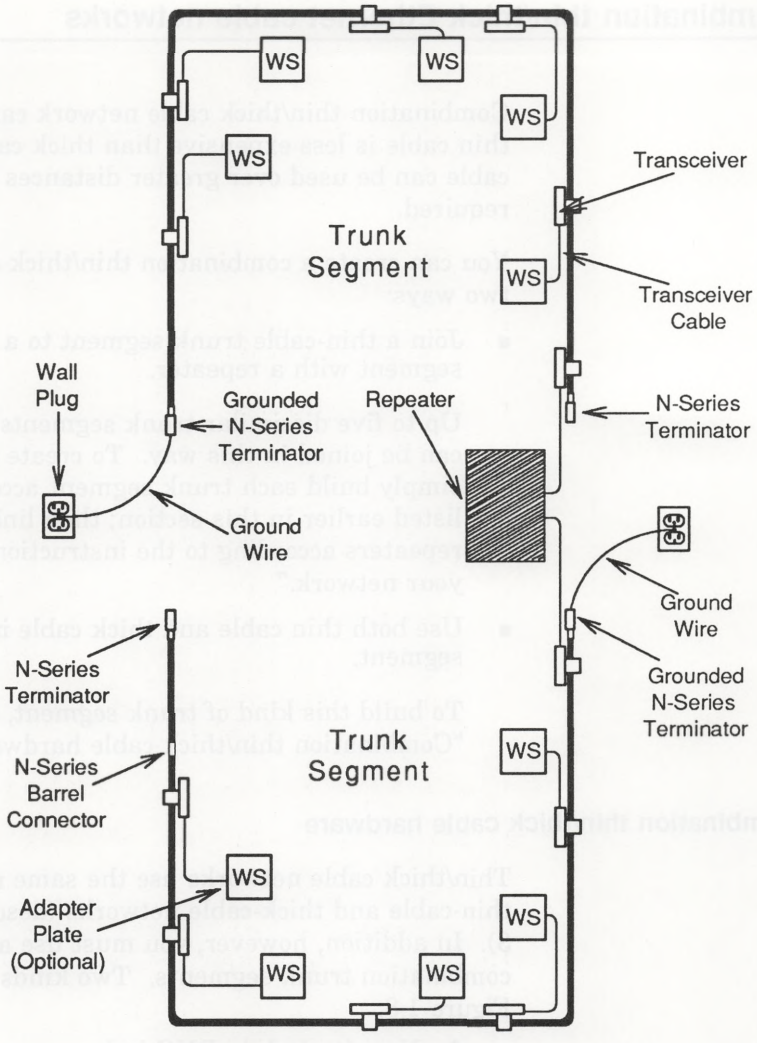


Figure 1.7
Typical layout of a thick Ethernet cable network

Combination thin/thick Ethernet cable networks

Combination thin/thick cable network can save money, because thin cable is less expensive than thick cable. In addition, thick cable can be used over greater distances before a repeater is required.

You can create a combination thin/thick cable network in one of two ways:

- Join a thin-cable trunk segment to a thick-cable trunk segment with a repeater.

  Up to five dissimilar trunk segments (using four repeaters) can be joined in this way. To create this kind of network, simply build each trunk segment according to the instructions listed earlier in this section; then link the segments with repeaters according to the instructions in Section 3, "Cabling your network."

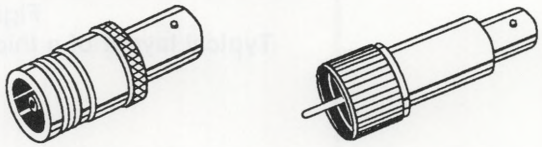
- Use both thin cable and thick cable in the same trunk segment.

  To build this kind of trunk segment, see the following section, "Combination thin/thick cable hardware."

Combination thin/thick cable hardware

Thin/thick cable networks use the same networking hardware as thin-cable and thick-cable networks (described beginning on page 3). In addition, however, you must use adapters to create the combination trunk segments. Two kinds of adapters are shown in Figure 1.8:

- An N-series jack to BNC jack
- An N-series plug to BNC jack



N-Series Jack to BNC Jack

N-Series Plug to BNC Jack

Figure 1.8
Adapters used in combination trunk segments

Combination thin/thick cable network layout

This section describes how to combine thin cable and thick cable within a single trunk segment, using as much thin cable as possible.

Note: The following information is based on the use of 3Com hardware. If you are using transceivers other than 3Com 3C100 transceivers or their equivalents, use the documentation supplied with those transceivers.

Combination thin/thick cable trunk segments are between 987 and 3,280 feet long. The maximum number of trunk segments is five.

To find the maximum amount of thin cable you can use in one combination trunk segment, use the following equation:

$$\frac{3{,}280\ \textit{feet} - L}{3.28} = t$$

L = length of the trunk segment you want to build.
t = the maximum length of thin cable you can use.

For example, if you want to build a trunk segment that is 2,300 feet long and you want to minimize the cost of hardware by using as much thin cable as possible, you would use the following equation:

$$\frac{3{,}280\ \textit{feet} - 2{,}300\ \textit{feet}}{3.28} = 299\ \textit{feet}$$

You could use up to 299 feet of the less expensive thin cable. You would use thick cable for the remaining 2,001 feet of cable required in your trunk segment.

Refer to Figure 1.9 for an example of a combination thin/thick Ethernet cable network layout.

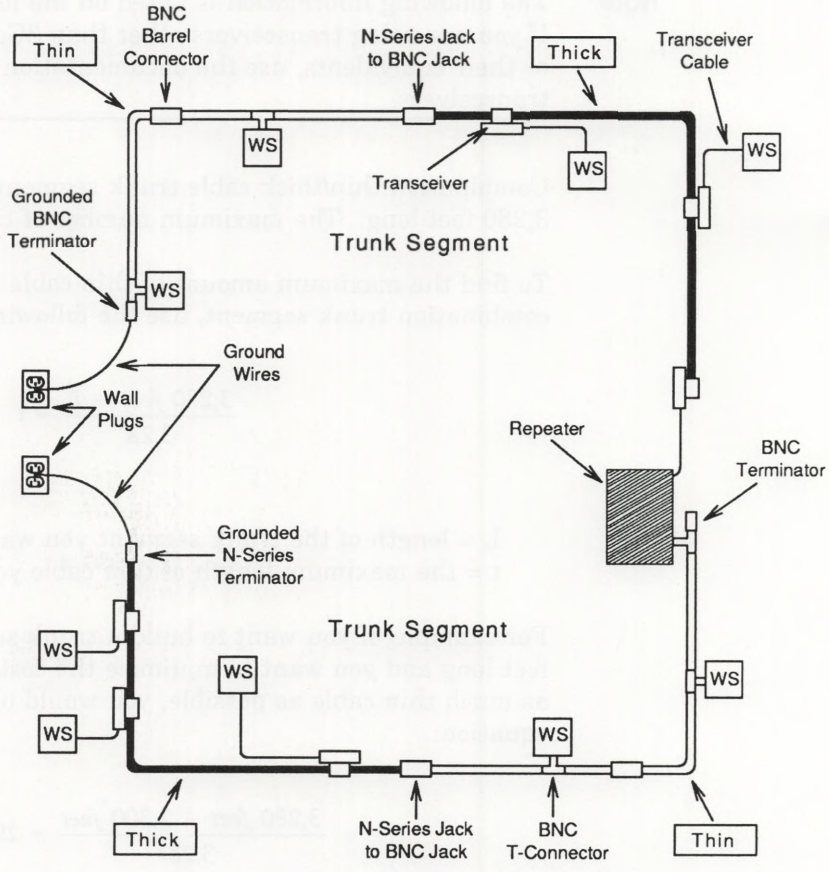


Figure 1.9
Typical layout of a combination thin/thick cable network

Twisted pair Ethernet cable networks

This section describes the hardware and typical cabling layout for a twisted pair Ethernet network.

Hardware for twisted pair cable networks

The hardware needed to set up a twisted pair Ethernet cable network is described below and illustrated in Figure 1.10 on page 16.

Network board

The network board, a printed circuit board, is installed into each network station (including servers, routers, and workstations). The board's mounting bracket allows for twisted pair or thick cabling.

Twisted pair Ethernet cable

Twisted pair Ethernet cable can be shielded or unshielded. Unshielded cable, 24 AWG with RJ45 connectors, is used most often because it is inexpensive, flexible, and easily installed.

Concentrator

The concentrator acts as the hub of a star-configured, twisted pair network. A single network can have up to four concentrators.

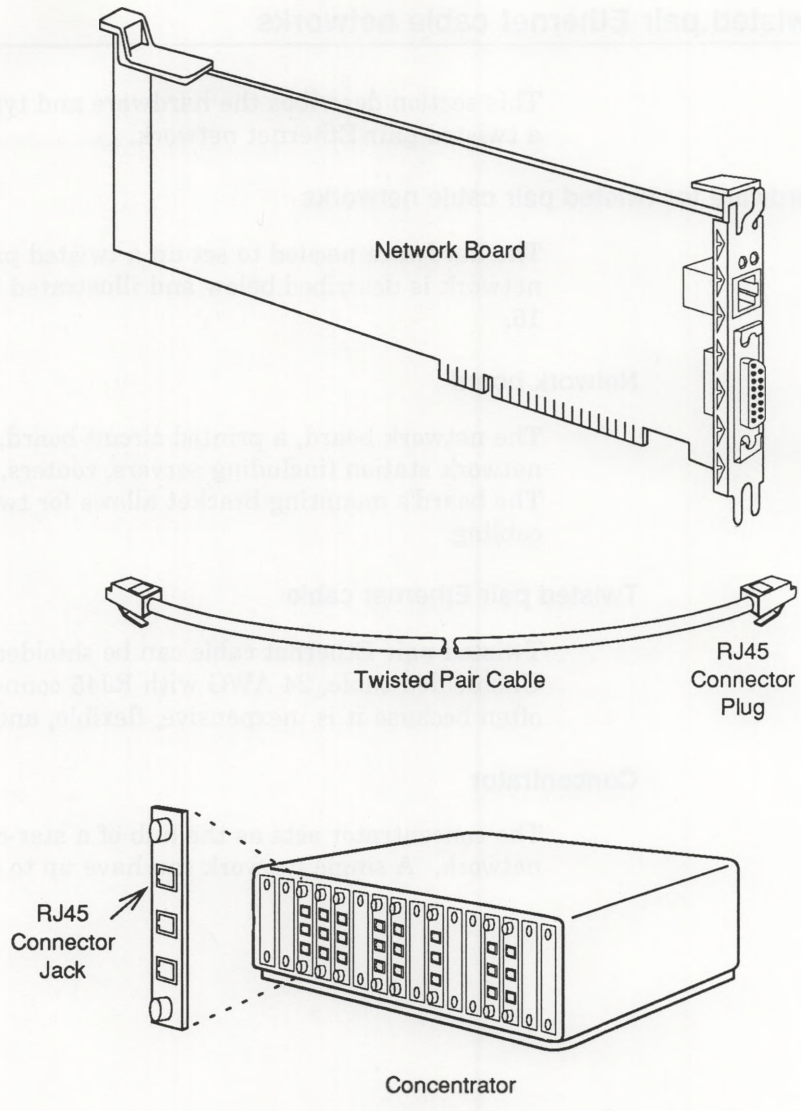


Figure 1.10
Hardware for twisted pair cable networks

Twisted pair cable network layout

The following limitations apply to a twisted pair cable network:

- Maximum segment length (unshielded): 328 feet (100 meters)
- Maximum number of trunk segments: 1024
- Maximum number of repeaters: 4 (5 segments with 3 tapped)

Figure 1.11 illustrates a typical twisted pair cabling layout.

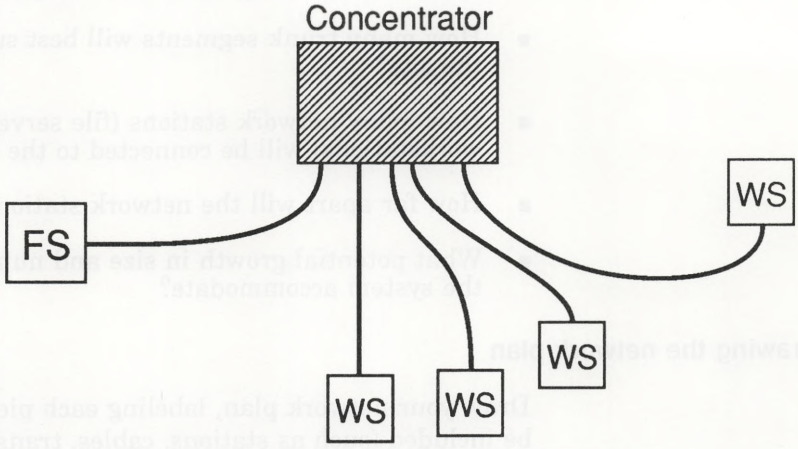


Figure 1.11
Typical layout of a twisted pair cable network

Planning your network layout

This section explains how to evaluate your network needs and draw up a network plan.

Evaluating your network needs

Define your particular network needs by considering the following questions:

- How large an area must the cabling system cover?
- How many trunk segments will best suit the physical layout of the site?
- How many network stations (file servers, routers, and workstations) will be connected to the cabling system?
- How far apart will the network stations be?
- What potential growth in size and number of connections must the system accommodate?

Drawing the network plan

Draw your network plan, labeling each piece of hardware that will be included (such as stations, cables, transceivers, repeaters, and BNC terminators). Then, keeping in mind the rules given in the appropriate summary, make a diagram of your network layout. Be sure to include the following items in your planning:

- Check the distances between all components to make sure that they fall within the appropriate parameters.
- Ensure that the locations you choose for file servers have adequate room for any peripherals (such as printers or external disk drives) that will be attached.

You are now ready to proceed to Section 2, "Configuring and installing 3COM EtherLink boards."

Section 2: Configuring 3Com EtherLink boards

The boards listed in this section can be used in workstations, file servers, and routers on any size network.

Use the following chart to locate the information you need.

Board	Page
EtherLink 3C501 (Assy. #1221)	22
EtherLink Plus 3C505 (Assy. #1194)	28
EtherLink Plus 3C505 (Assy. #2012) *	35
EtherLink II 3C503 (Assy. #2227) *	42
EtherLink II TP 3C503 (Assy. #6330) *	47
EtherLink/MC 3C523 (Assy. #4233) *	53
EtherLink/MC TP 3C523 (Assy. #6852) *	58

If you are using a COMPAQ model 20E (or other COMPAQ model) using Revision D.1 video controller ROM, do not use base I/O address 2EOh for any EtherLink network board. Use an alternative set of configuration values that do not include this setting.

* Only boards marked with an asterisk can be used in file servers running NetWare v3.*x*. See the following page.

File servers running NetWare v3.*x*

Only the following boards can be used in file servers running NetWare v3.*x*:

- EtherLink Plus 3C505 (Assy. #2012) with the 3C505.LAN driver
- EtherLink II 3C503 (Assy. #2227) board with the 3C503.LAN driver
- EtherLink II TP 3C503 (Assy. #6330) board with the 3C503.LAN driver
- EtherLink/MC 3C523 (Assy. #4233) with the 3C523.LAN driver
- EtherLink/MC TP 3C523 (Assy. #6852) with the 3C523.LAN driver

Specific settings for network boards used in file servers running NetWare v3.*x* are included in each board's respective section on the following pages.

Configuration guidelines

Use the following guidelines when configuring your boards:

- Avoid hardware conflicts.

  The board setting cannot be used by another device in the machine, such as a graphics adaptor or a modem adaptor.
- Use the numbered configuration options when ever possible.

  The numbered options help you identify hardware conflicts and simplify configuring the LAN driver.
- Use default settings when possible (usually option 0).

  If you install two network boards in the same station, each must have a nonconflicting setting.
- Use the same configuration option for all workstation network boards of the same type.

  This simplifies creating boot files and boot diskettes (as long as none of the settings conflict with settings required by other boards or devices in the machine).

Labeling network boards

To simplify network setup and administration, record the configuration information for each network board on a string tag, an adhesive label, or some other form of identification attached to the board.

Label each board with the following information:

- **The specific network station** into which the board will be inserted. Identify the station by its intended physical location or user.
- **The type of station** into which the board will be inserted: workstation, router, file server running NetWare v2.*x*, or file server running NetWare v3.*x*.
- **The configuration option** or settings you plan to use for the board.
- **The connector type** for the type of cable you are using.
- **Remote Reset** (if you plan to enable Remote Reset on a workstation network board).

Configuring EtherLink 3C501 (Assy. #1221) boards

This section explains the proper procedure for configuring this board, and then refers you to the appropriate section of this manual for additional instructions.

Configuration procedure

Use the following procedure to configure your board:

1. **Locate the hardware components on the network board.**

   Refer to Figure 2.1.

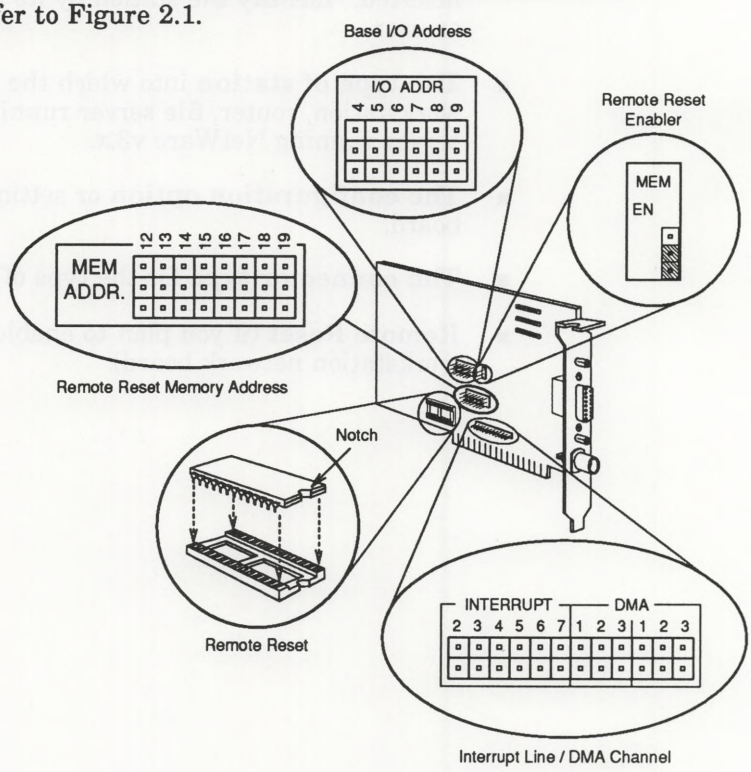
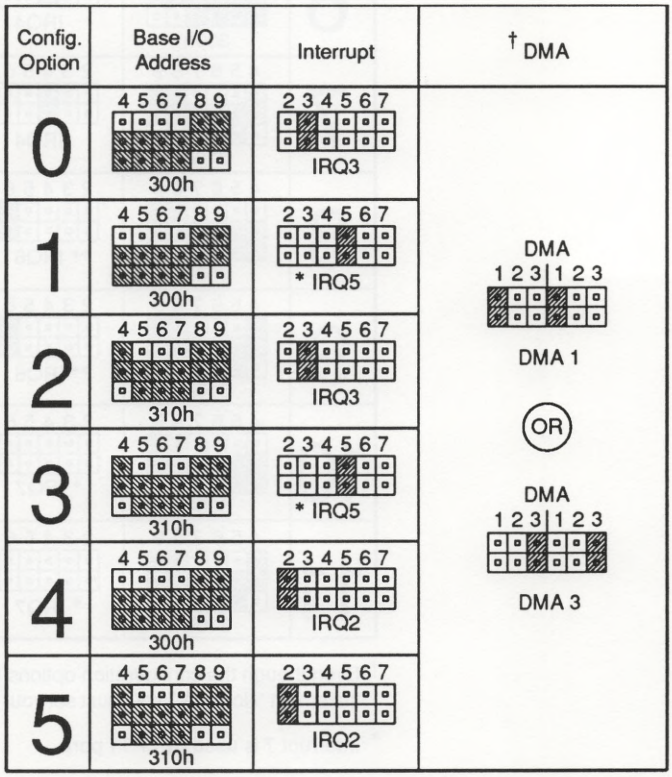


Figure 2.1
Configuration option components
for EtherLink 3C501 (Assy. #1221) board

2. Set the interrupt line, the base I/0 address, and the DMA channel.

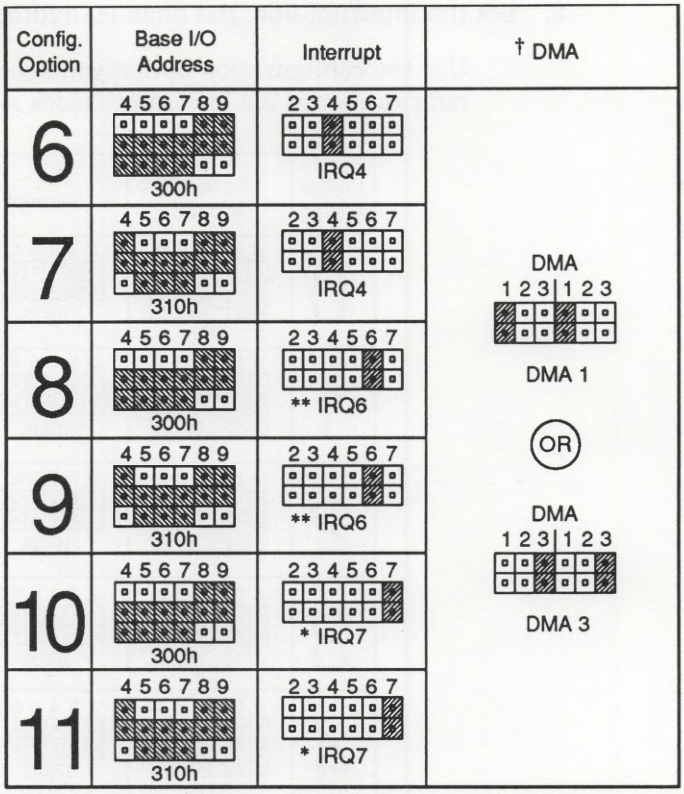
Use the configuration option you specified on the board's label and refer to Figure 2.2 for jumper block settings.



† Even though the configuration options for EtherLink boards include the statement No DMA, you must set your boards to one of the two settings.

* Interrupt 5 is used by the fixed disk adapter on PC's and PC compatibles.

Figure 2.2
Configuration options for EtherLink 3C501 (Assy. #1221) board
(figure continued on page 24)



† Even though the configuration options for EtherLink boards include the statement "No DMA," you must set your boards to one of the two settings.

* Interrupt 7 is used by LPT1 port.

** Interrupt 6 is used by the floppy disk adapter on PC's, AT's, and compatibles.

Figure 2.2 (*continued*)
Configuration options for EtherLink 3C501 (Assy. #1221) board

3. Set the connector type.

Place the jumper blocks on either the BNC pins or the DIX pins as shown in Figure 2.3.

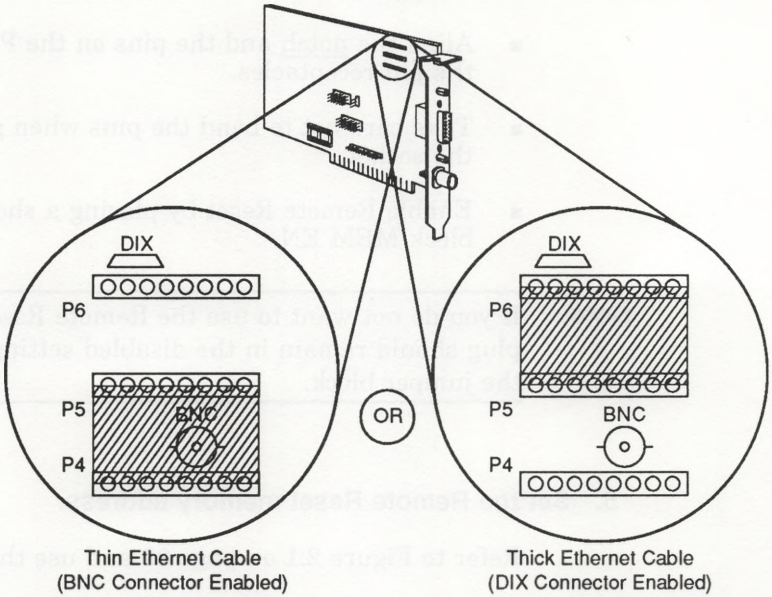


Figure 2.3
Connector type setting for EtherLink 3C501 (Assy. #1221) board

4. **Install the Remote Reset PROM and enable Remote Reset (optional).**

   See your Novell authorized reseller for 3Com EtherLink Remote Reset PROMs. Refer to Figure 2.1 on page 22 and use the following guidelines:

   - Align the notch and the pins on the PROM with the notch and the pin receptacles.
   - Take care not to bend the pins when pushing the PROM into the socket.
   - Enable Remote Reset by placing a shorting plug on jumper block MEM EN.

Note: If you do not want to use the Remote Reset feature, the shorting plug should remain in the disabled setting on the top two pins of the jumper block.

5. **Set the Remote Reset memory address.**

   Refer to Figure 2.1 on page 22 and use the following chart:

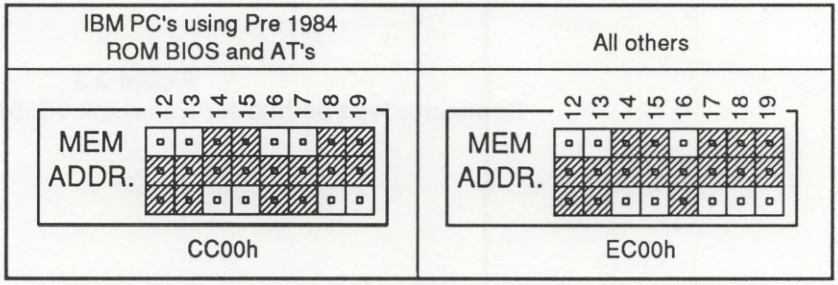


Figure 2.4
Remote Reset address for EtherLink 3C501 (Assy. #1221) board

6. **Insert the network board into any available slot.**

Make sure the workstation and all peripherals are turned off and unplugged before you install the board.

Where to go from here

If the network includes other boards, refer to the appropriate instructions for configuring and installing these boards.

If all your network boards are installed, refer to Section 3, "Cabling your network," on page 65.

This section explains the proper procedure for configuring this board, and then refers you to the appropriate section of this manual for additional instructions.

Configuration procedure

Use the following procedure to configure your board.

1. **Locate the hardware components on the network board.**

   Refer to Figure 2.5.

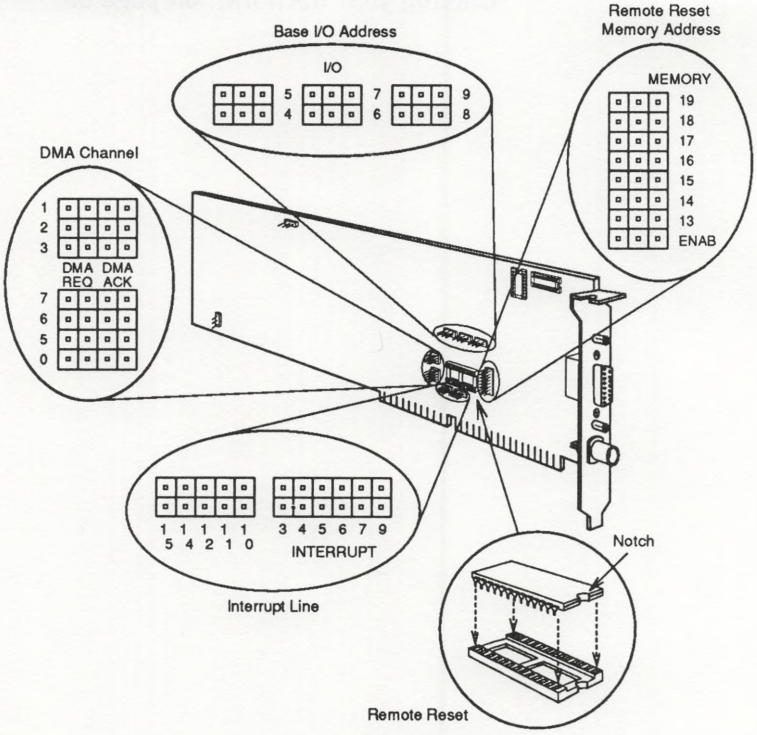


Figure 2.5
Configuration option components
for EtherLink Plus 3C505 (Assy. #1194) board

2. **Set the interrupt line, the base I/0 address, and the DMA channel.**
   Refer to Figure 2.6 for jumper block settings.

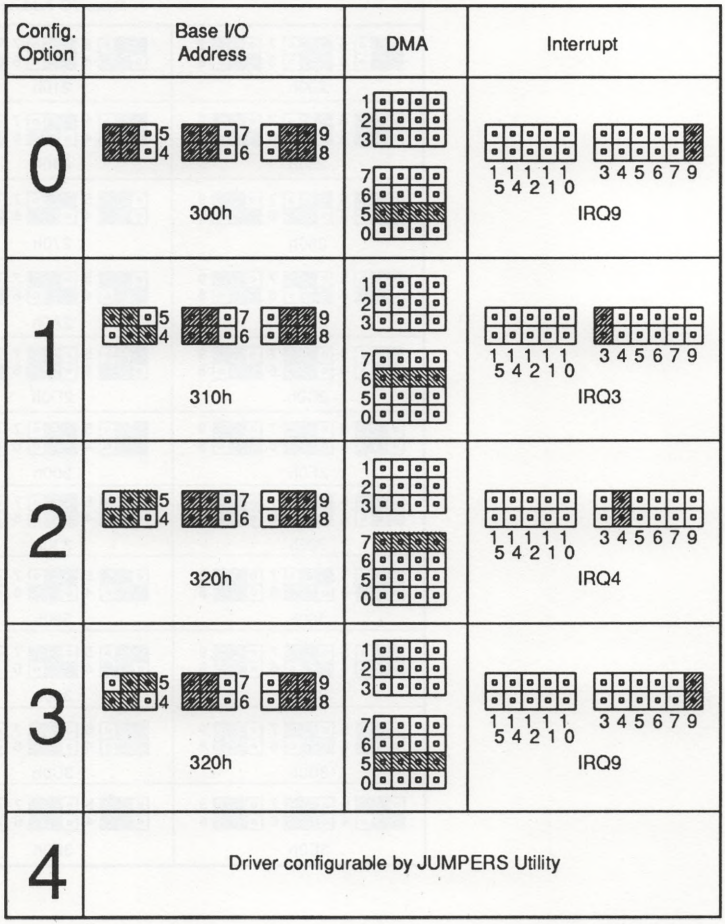


Figure 2.6
Configuration options for EtherLink Plus 3C505 (Assy. #1194) board

If you select option 4, use the jumper block settings on pages 30-31 and refer to the following manuals:

- For NetWare v2.*x*, see JUMPERS in the "Utilities Reference" section of *Using the Network*.
- For NetWare v3.*x*, see the "JUMPERS" section of *Netware v3.11 Utilities Reference*.

Select a base I/O setting from Figure 2.7.

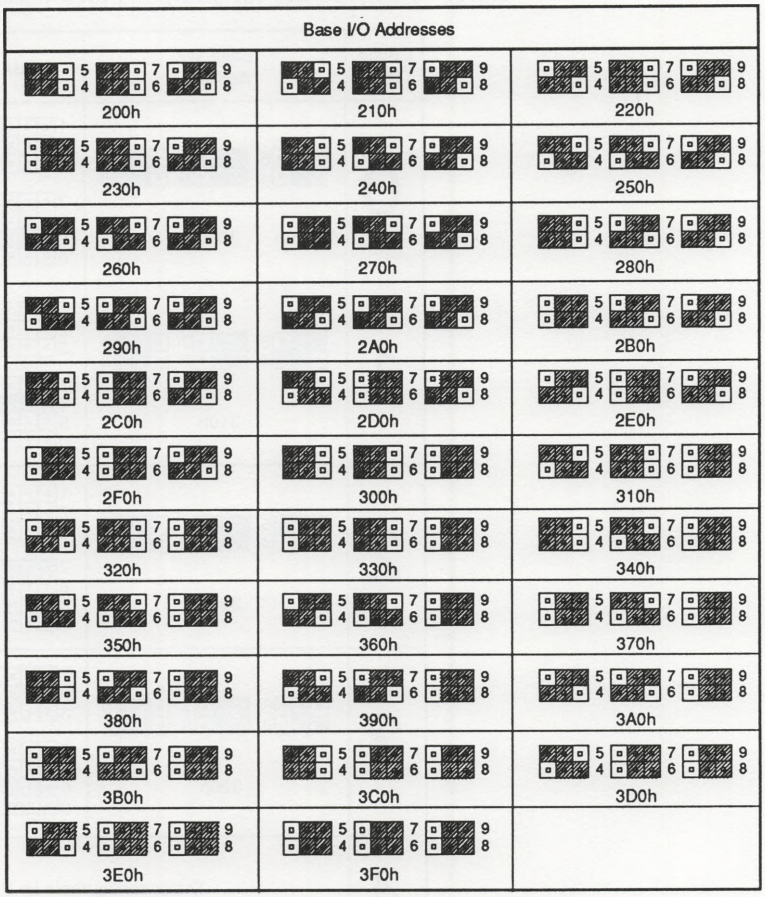


Figure 2.7
Base I/O options for EtherLink 3C505 (Assy. #1194) board

Select a DMA setting from Figure 2.8 and an interrupt setting from Figure 2.9.

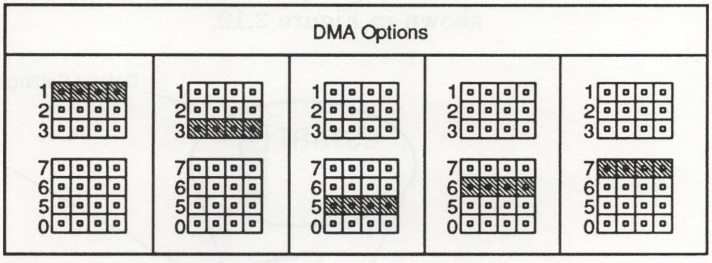


Figure 2.8
DMA options for EtherLink 3C505 (Assy. #1194) board

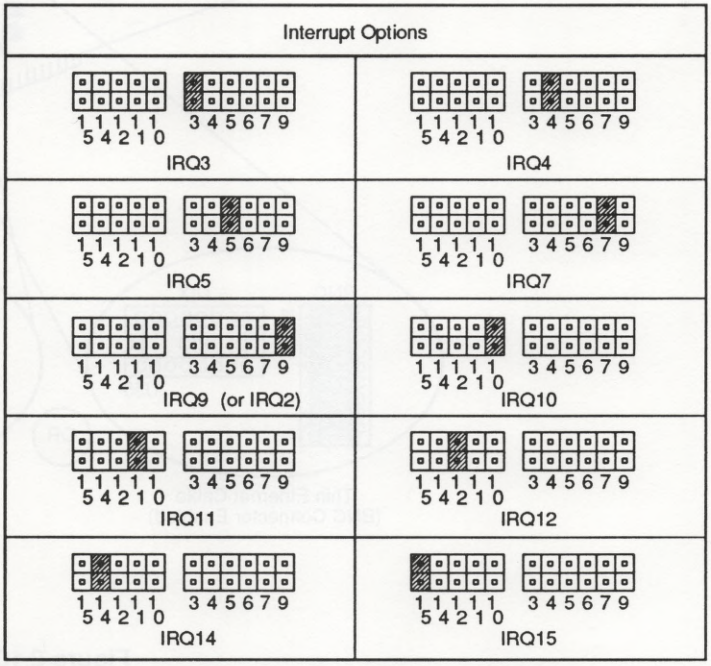


Figure 2.9
Interrupt options for EtherLink 3C505 (Assy. #1194) board

3. **Set the connector type.**

   Place the jumper blocks on either the BNC pins or the DIX pins as shown in Figure 2.10.

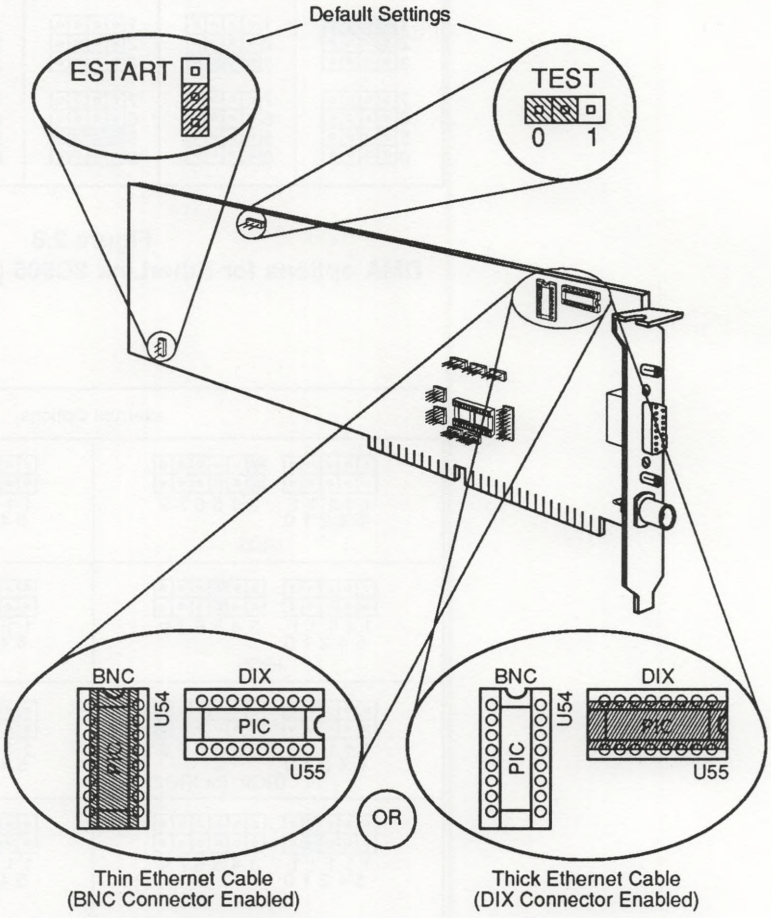


Figure 2.10
Connector type and ESTART and TEST defaults for EtherLink Plus 3C505 (Assy. #1194) board

4. **Set the "ESTART" and "TEST" jumper blocks to the defaults.**

   Refer to Figure 2.10.

5. **Install the Remote Reset PROM and enable Remote Reset (optional).**

   See your Novell authorized reseller for 3Com EtherLink Remote Reset PROMs. Use the following guidelines:

   - Align the notch and the pins on the PROM with the notch and the pin receptacles.
   - Take care not to bend the pins when pushing the PROM into the socket.

Note: If you do not want to use the Remote Reset feature, the shorting plug should remain in the disabled setting on the top two pins of the jumper block.

6. **Set the remote reset memory address.**

   Refer to Figure 2.5 on page 28 and the following chart:

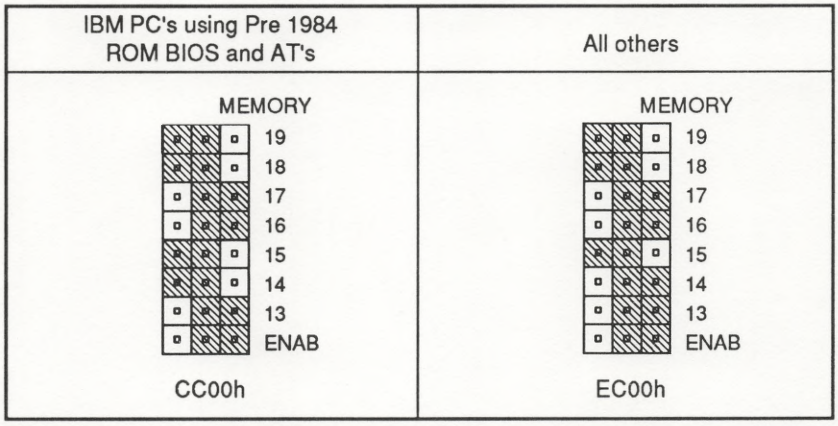


Figure 2.11
Remote Reset address for EtherLink 3C505 (Assy. #1194) board

7. **Insert the network board into any available slot.**

Make sure the workstation and all peripherals are turned off and unplugged before you install the board.

Where to go from here

If the network includes other boards, refer to the appropriate instructions for configuring these boards.

If all your network boards are installed, refer to Section 3, "Cabling your network," on page 65.

Configuring EtherLink Plus 3C505 (Assy. #2012) boards

This section explains the proper procedure for configuring this board, and then refers you to the appropriate section of this manual for additional instructions.

Configuration procedure

Use the following procedure to configure your board:

1. **Locate the hardware components on the network board.**

   Refer to Figure 2.12.

Do not use EtherLink Plus 3C505 (Assy. #2012) boards in file servers with 16 MB of memory or more.

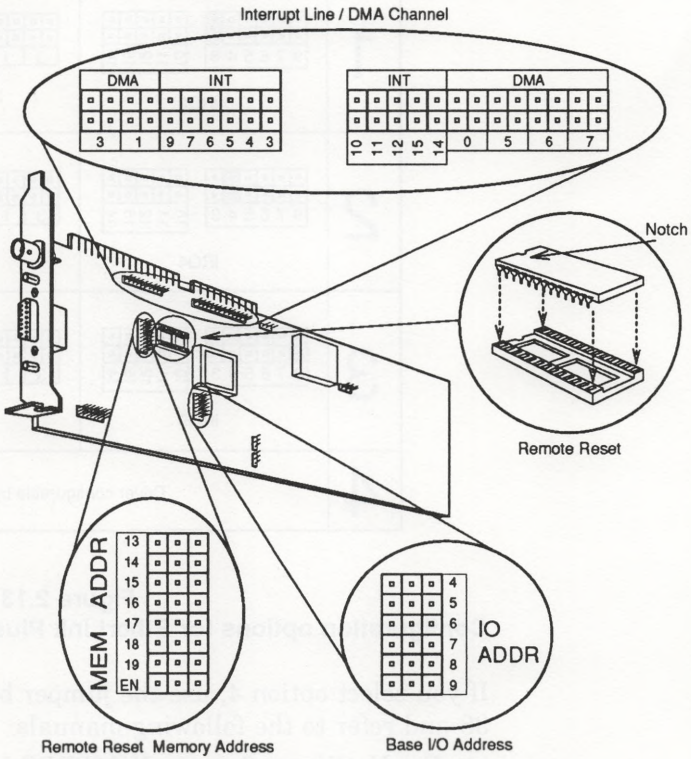


Figure 2.12
Configuration option components for EtherLink Plus 3C505 (Assy. #2012) board

2. **Set the interrupt line, the base I/0 address, and the DMA channel.**

   Use the configuration option you specified on the board's label.

   For **workstations, routers, and file servers running NetWare v2.*x***, refer to Figure 2.13 for jumper block settings.

   For **file servers running NetWare v3.*x***, refer to Figures 2.14, 2.15, and 2.16 for jumper block settings.

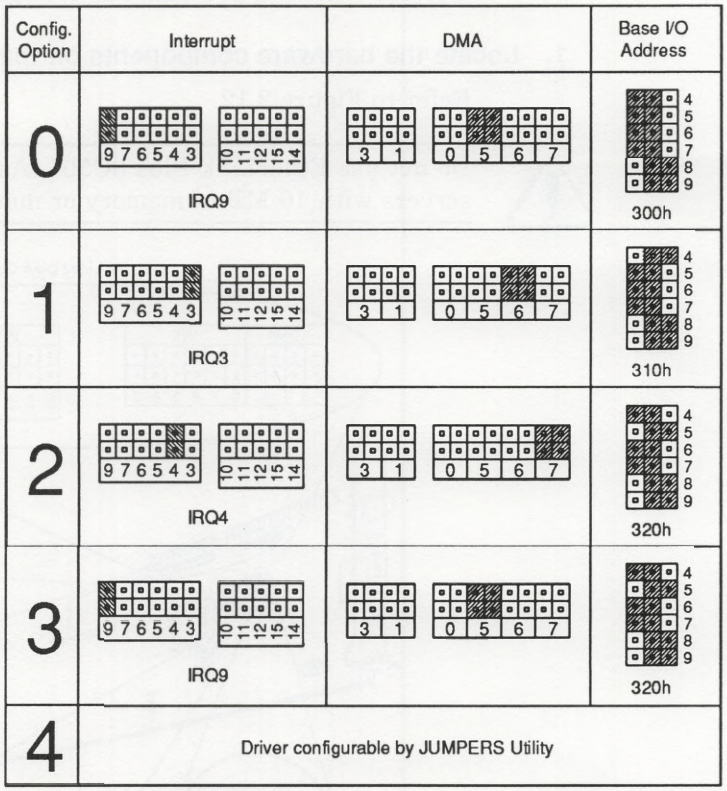


Figure 2.13
Configuration options for EtherLink Plus 3C505 (Assy. #2012) board

If you select option 4, use the jumper block settings on pages 37-38 and refer to the following manuals:

- For NetWare v2.*x*, see JUMPERS in the "Utilities Reference" section of *Using the Network*.
- For NetWare v3.*x*, see the "JUMPERS" section of *NetWare v3.x Utilities Reference*.

Select an interrupt setting from Figure 2.14 and a DMA setting from Figure 2.15.

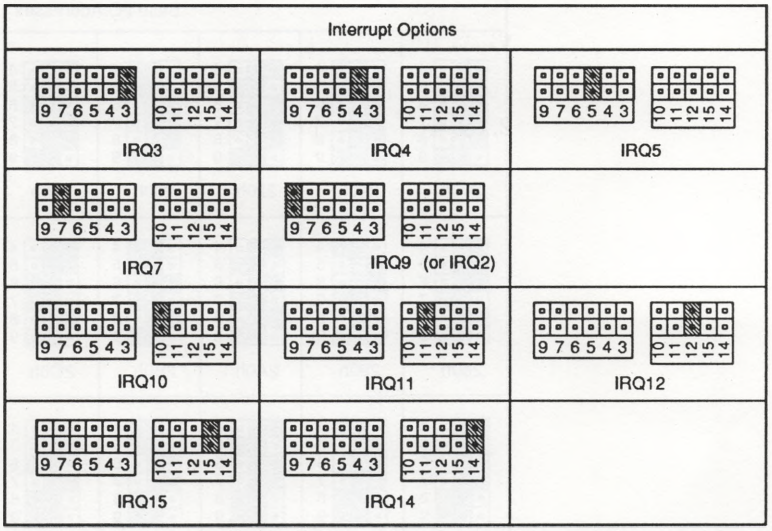


Figure 2.14
Interrupt options for 3C505 (Assy. #2012) board

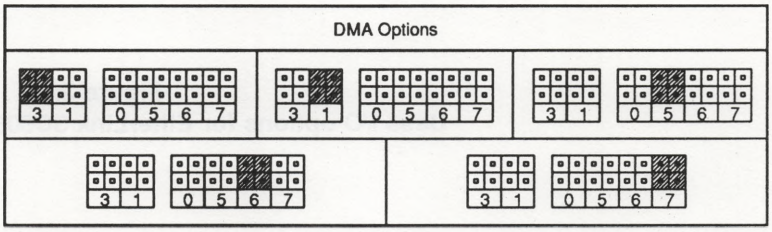


Figure 2.15
DMA options for EtherLink 3C505 (Assy. #2012) board

Select a base I/O setting from Figure 2.16.

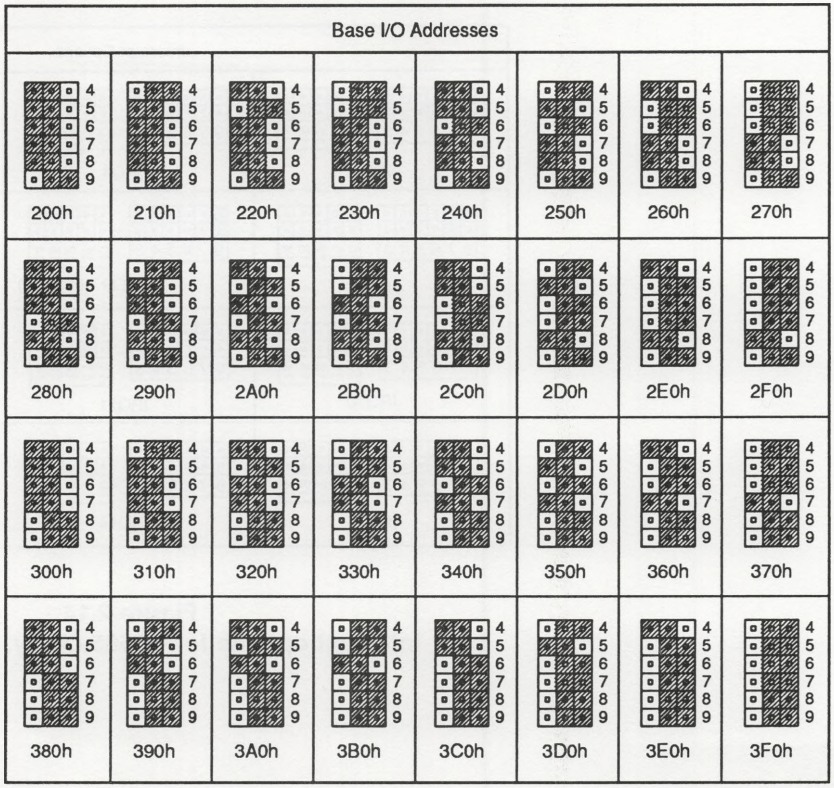


Figure 2.16
Base I/O options for EtherLink 3C505 (Assy. #2012) board

3. **Set the connector type.**

   Place the jumper blocks on either the BNC pins or the DIX pins as shown in Figure 2.17.

4. **Set the A15, A16, U17, and "TEST" jumper blocks to the default settings.**

   Refer to Figure 2.17.

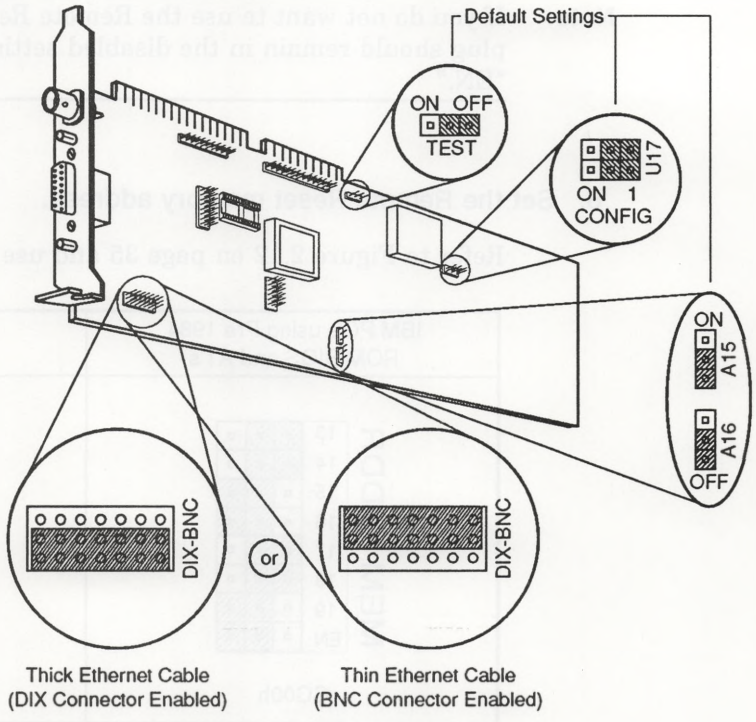


Figure 2.17
Connector type and A15, A16, U17, and TEST defaults for EtherLink Plus 3C505 (Assy. #2012) board

5. **Install the Remote Reset PROM and enable Remote Reset (optional).**

   See your Novell authorized reseller for 3Com EtherLink Remote Reset PROMs. Use the following guidelines:

   - Align the notch and the pins on the PROM with the notch and the pin receptacles.
   - Take care not to bend the pins when pushing the PROM into the socket.

Note: If you do not want to use the Remote Reset feature, the shorting plug should remain in the disabled setting on the jumper labeled "EN."

6. **Set the Remote Reset memory address.**

   Refer to Figure 2.12 on page 35 and use the following chart:

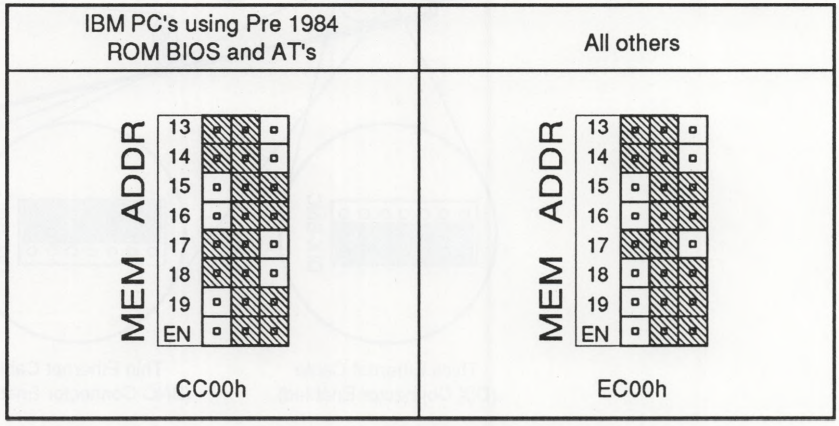


Figure 2.18
Remote Reset Address for EtherLink 3C505 (Assy. #2012) board

7. **Insert the network board into any available slot.**

Make sure the workstation and all peripherals are turned off and unplugged before you install the board.

Where to go from here

If the network includes other boards, refer to the appropriate instructions for configuring these boards.

If all your network boards are installed, refer to Section 3, "Cabling your network," on page 65.

Configuring EtherLink II 3C503 (Assy. #2227) boards

This section explains the proper procedure for configuring this board, and then refers you to the appropriate section of this manual for additional instructions.

The following settings are hardware controlled:

- Base I/O address
- Memory address
- Remote Reset

You select the following settings when you generate the workstation shell driver, router software, or server operating system.

- Interrupt line (IRQ)
- Connector type

Configuration procedure

Use the procedure on page 43 to configure your board.

1. **Locate the configuration components on the network board.**

   Refer to Figure 2.19.

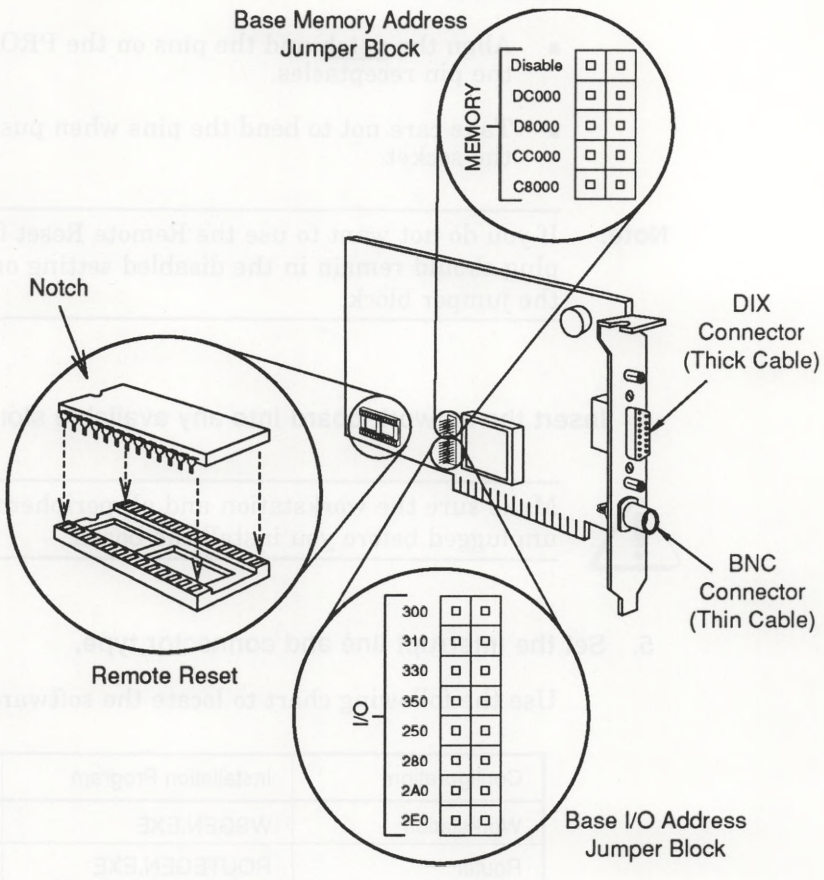


Figure 2.19
Configuration option components
for EtherLink II 3C503 (Assy. #2227) board

2. **Set the base I/O address and memory address.**

   Refer to Figure 2.20 on page 45 for jumper block settings.

   For **file servers running NetWare v3.*x***, refer to Figure 2.21 on page 46 for jumper block settings.

3. Install the Remote Reset PROM and enable Remote Reset (optional).

See your Novell authorized reseller for 3Com EtherLink Remote Reset PROMs.

- Align the notch and the pins on the PROM with the notch and the pin receptacles.
- Take care not to bend the pins when pushing the PROM into the socket.

Note: If you do not want to use the Remote Reset feature, the shorting plug should remain in the disabled setting on the top two pins of the jumper block.

4. Insert the network board into any available slot.

Make sure the workstation and all peripherals are turned off and unplugged before you install the board.

5. Set the interrupt line and connector type.

Use the following chart to locate the software you will need:

Configuration	Installation Program	NetWare Diskette
Workstation	WSGEN.EXE	WSGEN
Router	ROUTEGEN.EXE	ROUTEGEN
File Server	INSTALL.EXE	*SYSTEM-1

*System-1 is the first diskette in the series.

Note: If you use thick Ethernet cable with a file server running NetWare v3.*x*, specify the connector type at the command line when you load the 3C503.LAN driver:

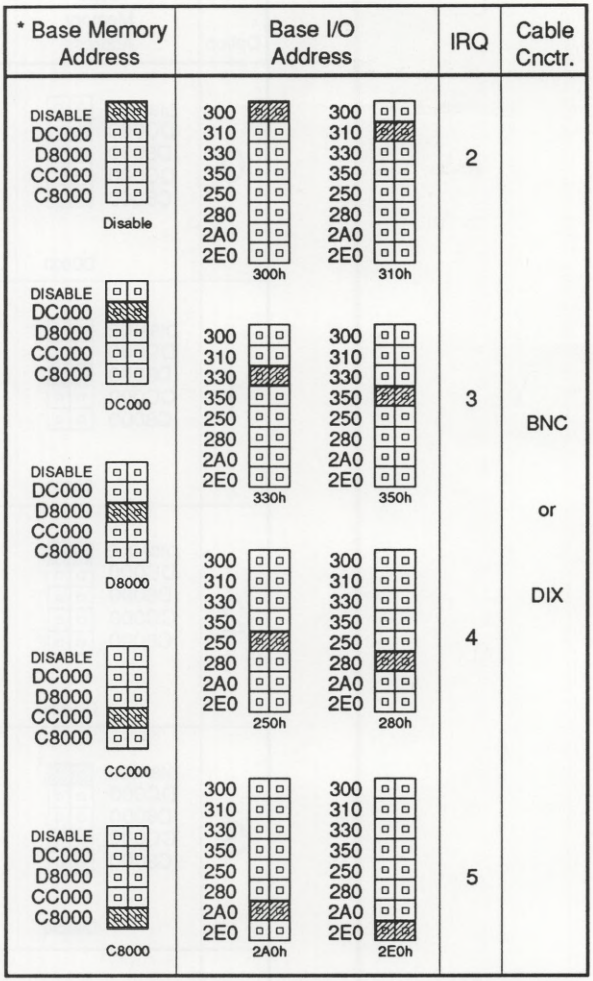
```
Load 3C503 DIX
```

Option	Base Memory Address	Base I/O Address	IRQ	Cable Cnctr.
0	DISABLE DC000 D8000 CC000 C8000 DC000	300 310 330 350 250 280 2A0 2E0 300h	3	BNC
1	DISABLE DC000 D8000 CC000 C8000 D8000	300 310 330 350 250 280 2A0 2E0 310h	2	DIX
2	DISABLE DC000 D8000 CC000 C8000 Disable	300 310 330 350 250 280 2A0 2E0 330h	4	BNC
3	DISABLE DC000 D8000 CC000 C8000 Disable	300 310 330 350 250 280 2A0 2E0 300h	3	DIX
4	Driver configurable by JUMPERS Utility			

Figure 2.20
Configuration options for EtherLink II 3C503 (Assy. #2227) board

If you select option 4, use the jumper block settings on page 46 and refer to the following manuals:

- For NetWare v2.*x*, see "JUMPERS" in the utilities section of *Using the Network*.
- For NetWare v3.*x*, see the "JUMPERS" section of *Netware v3.11 Utilities Reference*.



* DISABLE is not available for file servers running NetWare v3.x

Figure 2.21
EtherLink II 3C503 (Assy. #2227) jumper block settings

Where to go from here

If the network includes other boards, refer to the appropriate instructions for configuring these boards.

If all your network boards are installed, refer to Section 3, "Cabling your network," on page 65.

Configuring EtherLink II TP 3C503 (Assy. #6330) boards

This section explains the proper procedure for configuring this board, and then refers you to the appropriate section of this manual for additional instructions.

The following settings are hardware controlled:

- Base I/O address
- Memory address
- Impedance jumpers
- DC signal
- Receive threshold
- Link pulse
- Equalization
- Transmit level
- Remote Reset

You select the following settings when you generate the workstation shell driver, router software, or server operating system.

- Interrupt line (IRQ)
- Connector type

Configuration procedure

Use the procedure beginning on page 48 to configure your board.

1. **Locate the configuration components on the network board.**

   Refer to Figure 2.22.

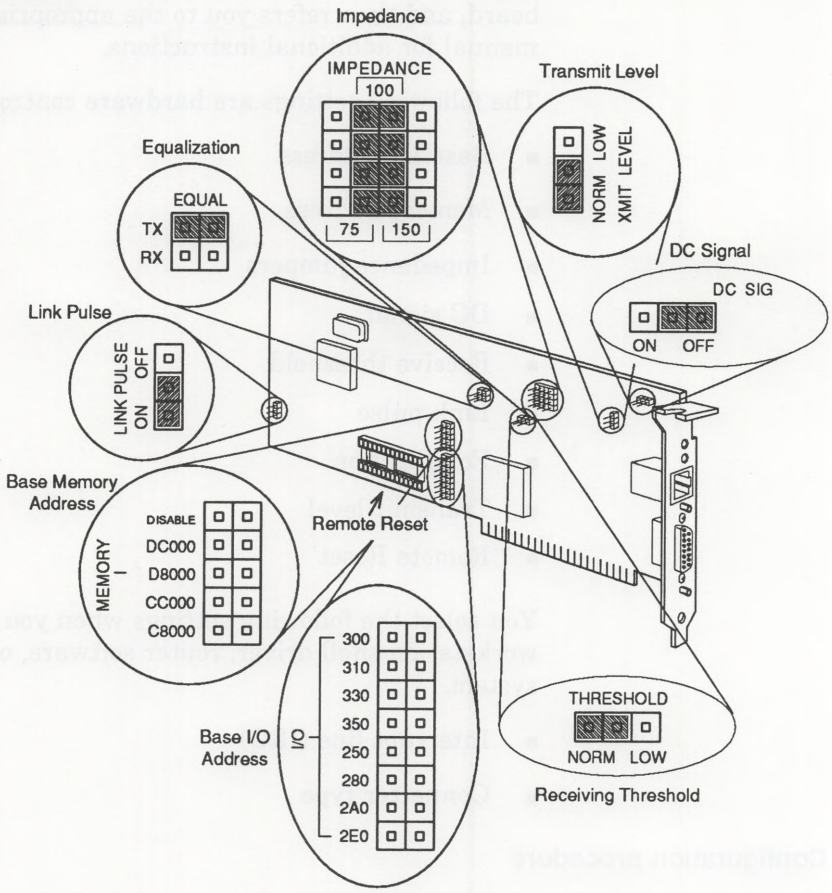


Figure 2.22
Configuration option components
for EtherLink II 3C503 TP (Assy. #6330) board

2. **Set the impedance jumper to match the impedance of your cable.**

   Standard 10BASE-T wiring uses the factory default setting 100 ohms, shown in Figure 2.22.

3. **Make sure the DC signal, transmit level, receive threshold, equalization, and link pulse jumpers are set to factory defaults.**

   The factory defaults, shown in Figure 2.22, are set to 10BASE-T specifications.

Note: If you are using a hub or cabling that is not designed to meet IEEE 10BASE-T specifications, refer to the documentation that accompanied the hardware for jumper settings.

4. **Set the base I/O address and memory address.**

   Use the settings you specified on the board's label.

   For **workstations, routers** and **file servers running NetWare v2.x**, refer to Figure 2.23 on page 51 for jumper block settings.

   For **file servers running NetWare v3.x**, refer to Figure 2.24 on page 52 for jumper block settings.

5. **Install the Remote Reset PROM and enable Remote Reset (optional).**

   Refer to Figure 2.22 and use the following instructions.

   - Align the notch and the pins on the PROM with the notch and the pin receptacles.
   - Take care not to bend the pins when pushing the PROM into the socket.

6. **Insert the network board into any available slot.**

Make sure the workstation and all peripherals are turned off and unplugged before you install the board.

7. **Set the interrupt level and connector type.**

Use the following chart to locate the software you will need.

Configuration	Installation Program	NetWare Diskette
Workstation	WSGEN.EXE	WSGEN
Router	ROUTEGEN.EXE	ROUTEGEN
File Server	INSTALL.EXE	*SYSTEM-1

*System-1 is the first diskette in the series.

Note: If you use thick Ethernet cable with a file server running NetWare v3.*x*, specify the connector type at the command line when you load the 3C503.LAN driver:

```
Load 3C503 DIX
```

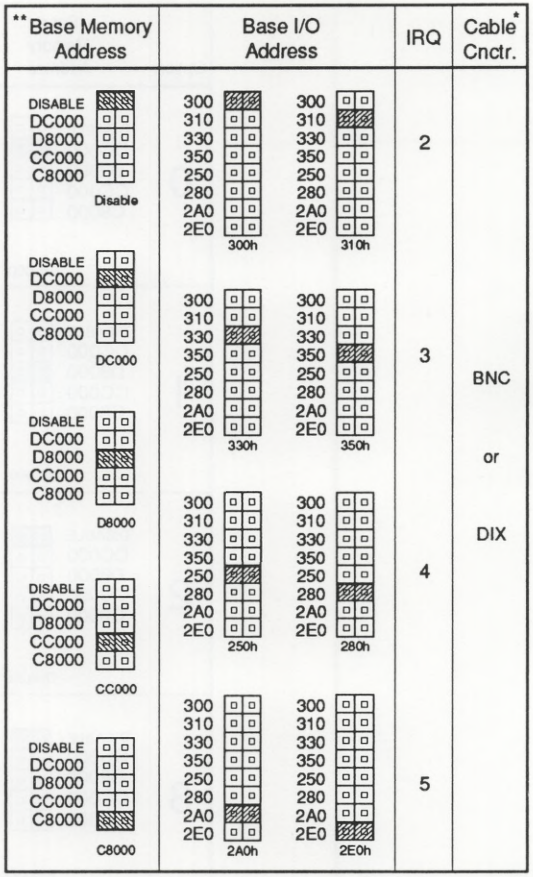
Option	Base Memory Address	Base I/O Address	IRQ	* Cable Cnctr.
0	DISABLE DC000 D8000 CC000 C8000 DC000	300 310 330 350 250 280 2A0 2E0 300h	3	BNC
1	DISABLE DC000 D8000 CC000 C8000 D8000	300 310 330 350 250 280 2A0 2E0 310h	2	DIX
2	DISABLE DC000 D8000 CC000 C8000 Disable	300 310 330 350 250 280 2A0 2E0 330h	4	BNC
3	DISABLE DC000 D8000 CC000 C8000 Disable	300 310 330 350 250 280 2A0 2E0 300h	3	DIX
4	Driver configurable by JUMPERS Utility			

* For twisted pair cabling, use the default connector setting BNC.

Figure 2.23
Configuration options for EtherLink II 3C503 TP (Assy. #6330) board

If you select option 4, use the jumper block settings on page 52 and refer to the following manuals:

- For NetWare v2.*x*, see JUMPERS in the "Utilities Reference" section of *Using the Network*.
- For NetWare v3.*x*, see the "JUMPERS" section of *NetWare v3.x Utilities Reference*.



* For twisted pair cabling, use the default connector setting BNC.

** DISABLE is not available for file servers running NetWare v3.x

Figure 2.24
Jumper block settings for EtherLink II TP 3C503 (Assy. #6330)

Select one setting from each column (one IRQ, one base memory address, one base I/O address, and a cable connector).

Where to go from here

If the network includes other boards, refer to the appropriate instructions for configuring and installing these boards.

If the all your network boards are installed, refer to Section 3, "Cabling your network," on page 65.

Configuring EtherLink/MC 3C523 (Assy. #4233) boards

This section explains the proper procedure for configuring this board, and then refers you to the appropriate section of this manual for additional instructions.

To complete these instructions, you will need the following:

- A working copy of the *REFERENCE* (or similarly named) diskette
- A working copy of the *ETHERLINK/MC OPTION* diskette that you received with your EtherLink/MC 3C523 network board

If you have not made copies of these diskettes, do so before continuing with these instructions.

Configuration procedure

Use the procedure beginning on page 54 to configure your board.

1. **Install the Remote Reset PROM and enable Remote Reset (optional).**

   Refer to Figure 2.25 and use the following instructions:

   - Align the notch and the pins on the PROM with the notch and the pin receptacles.
   - Take care not to bend the pins when pushing the PROM into the socket.

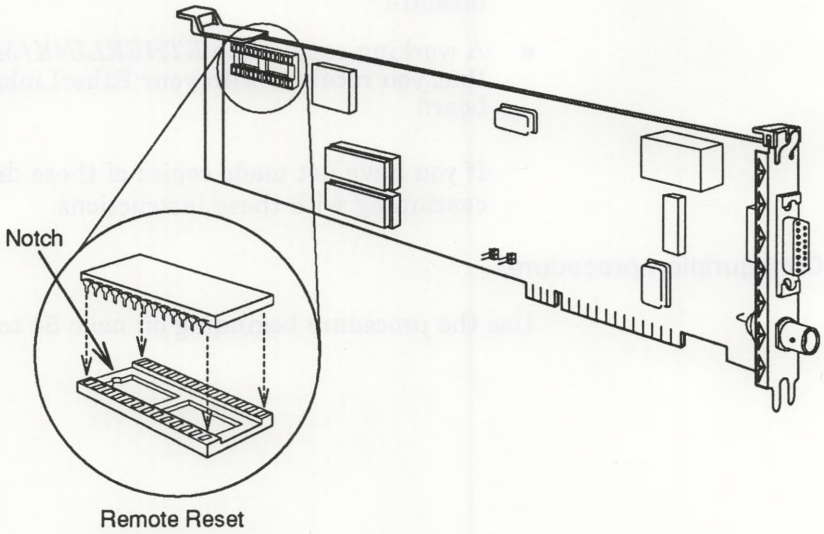


Figure 2.25
Remote Reset for EtherLink/MC 3C523 (Assy. #4233)

2. **Insert the network board into any available slot.**

Make sure the workstation and all peripherals are turned off and unplugged before you install the board.

3. **Copy the option files from the *ETHERLINK/MC OPTION* diskette to the *REFERENCE* diskette.**

   Consult the manual that came with your microchannel architecture system for instructions.

4. **Run the REFERENCE (or similarly named) setup program. Do not automatically configure the system.**

   a. Select the option that allows you to *set* the board's configuration.

   b. Select the option that allows you to *change* the board's configuration.

   c. Scroll to the slot number that corresponds to the inserted board's expansion slot.

   d. Enable the adapter.

   e. Set the I/O address range, the interrupt level, and the RAM buffer address according to the configuration option you specified on the board's label.

      Refer to Figure 2.26 on page 56 for configuration options.

      For **file servers running NetWare v3.*x***, refer to Figure 2.27 on page 57 for configuration options.

      - If you are setting a file server or router board, the settings on the screen must match the configuration settings in the operating system or router software.
      - If you are setting a workstation board, choose any combination of settings (except those identified in the following note). The shell will configure itself to the board settings when you boot the computer.

Note: The NetWare operating system does not allow duplicate interrupt lines. Choose an interrupt level that does not conflict with the interrupt line of other boards in the station.

In microchannel workstations, the LPT1 port uses level 7.

---

   f. Save the changes and exit the program.

Option Number	I/O Address Range	Interrupt Level	RAM Buffer Address
Option 0	300h	3	0C0000h
Option 1	1300h	7	0C8000h
Option 2	2300h	9	0D0000h
Option 3	3300h	12	0D8000h
Option 4	1300h	9	0C0000h
Option 5	2300h	12	0C8000h
Option 6	3300h	3	0D0000h
Option 7	300h	7	0D8000h
Option 8	2300h	3	0C0000h
Option 9	3300h	7	0C8000h
Option 10	300h	9	0D0000h
Option 11	1300h	12	0D8000h
Option 12	3300h	9	0C0000h
Option 13	300h	12	0C8000h
Option 14	1300h	3	0D0000h
Option 15	2300h	7	0D8000h

** Do not use a configuration option that includes Interrupt level 7.

Figure 2.26
Configuration options for EtherLink/MC 3C523 board

Interrupt Level	Connector Type	Base I/O Address	RAM Buffer Address
3 *	BNC	300 *	C0000 *
9	or	1300	C8000
7	DIX	2300	D0000
12		3300	D8000

* Default Settings

Figure 2.27
Settings for EtherLink/MC 3C523 boards in NetWare v3.*x* servers

For NetWare v3.*x* file servers, select configuration options using any combination of the information in Figure 2.27.

Where to go from here

After you have completed hardware and software installation of your boards, continue with Section 3, "Cabling your network," on page 65.

Configuring EtherLink/MC 3C523 TP (Assy. #6852) boards

This section explains the proper procedure for configuring this board, and then refers you to the appropriate section of this manual for additional instructions.

The following settings are hardware controlled:

- Impedance
- DC signal
- Receive threshold
- Link beat
- Equalization
- Transmit level
- Remote reset

You select the following settings when you generate the workstation shell driver, router software, or server operating system.

- Interrupt line (IRQ)
- DMA channel
- Transceiver type

To complete these instructions, you will need the following:

- A working copy of the *REFERENCE* (or similarly named) diskette
- A working copy of the *ETHERLINK/MC OPTION* diskette that you received with your EtherLink/MC 3C523 TP network board

  If you have not made copies of these diskettes, do so before continuing with these instructions.

Configuration procedure

Use the following procedure to configure your board.

1. Locate the configuration components on the network board.

Refer to Figure 2.28.

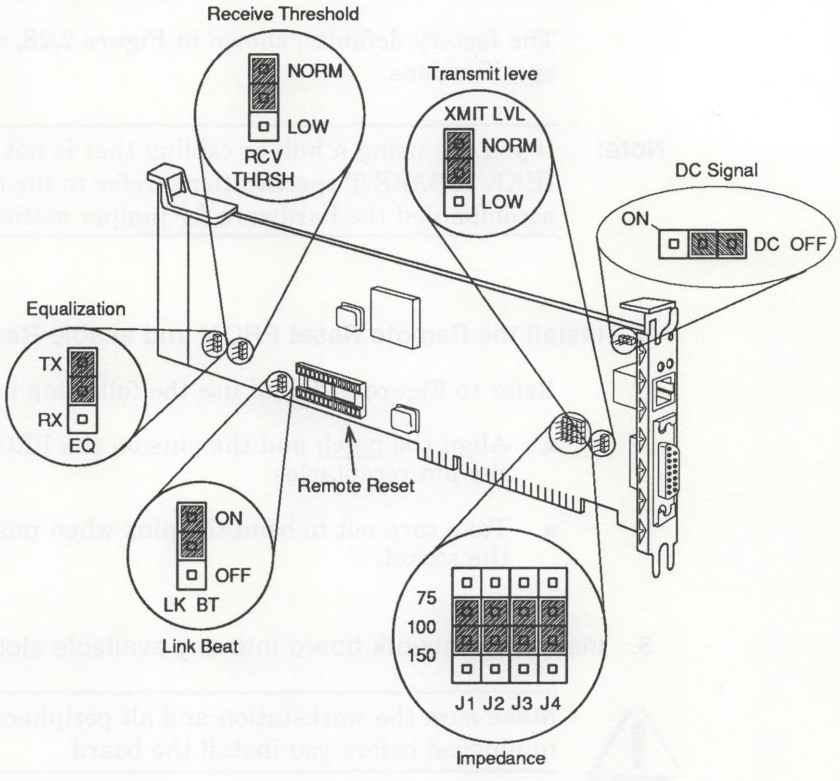


Figure 2.28
Configuration option components
for EtherLink/MC TP 3C523 (Assy. #6852) board

2. **Set the impedance jumper to match the impedance of your cable.**

   Standard 10BASE-T wiring uses the factory default setting 100 ohms, shown in Figure 2.28.

3. **Make sure that the DC signal, transmit level, receive threshold, equalization, and link pulse jumpers are set to factory defaults.**

   The factory defaults, shown in Figure 2.28, are set to 10BASE-T specifications.

Note: If you are using a hub or cabling that is not designed to meet IEEE 10BASE-T specifications, refer to the documentation that accompanied the hardware for jumper settings.

4. **Install the Remote Reset PROM and enable Remote Reset (optional).**

   Refer to Figure 2.28 and use the following instructions:

   - Align the notch and the pins on the PROM with the notch and the pin receptacles.
   - Take care not to bend the pins when pushing the PROM into the socket.

5. **Insert the network board into any available slot.**

Make sure the workstation and all peripherals are turned off and unplugged before you install the board.

6. **Copy the option files from the *ETHERLINK/MC OPTION* diskette to the *REFERENCE* diskette.**

   Consult the manual that came with your microchannel architecture system for instructions.

7. **Run the REFERENCE (or similarly named) setup program. Do not automatically configure the system.**

   a. Select the option that allows you to *set* the board's configuration.

   b. Select the option that allows you to *change* the board's configuration.

   c. Scroll to the slot number that corresponds to the inserted board's expansion slot.

   d. Enable the adapter.

   e. Set the I/O address range, the interrupt level, and the RAM buffer address according to the configuration option you specified on the board's label.

      Refer to Figure 2.29 on page 62 for configuration options.

      For **file servers running NetWare v3.*x***, refer to Figure 2.30 on page 63 for configuration options.

      - If you are setting a file server or router board, the settings on the screen must match the configuration settings in the operating system or router software.

      - If you are setting a workstation board, choose any combination of settings (except those identified in the following note). The shell will configure itself to the board settings when you boot the computer.

Note: The NetWare operating system does not allow duplicate interrupt lines. Choose an interrupt level that does not conflict with the interrupt line of other boards in the station.

In microchannel workstations, the LPT1 port uses level 7.

---

   f. Save the changes and exit the program.

Option Number	I/O Address Range	Interrupt Level	RAM Buffer Address
Option 0	300h	3	0C0000h
Option 1	1300h	7	0C8000h
Option 2	2300h	9	0D0000h
Option 3	3300h	12	0D8000h
Option 4	1300h	9	0C0000h
Option 5	2300h	12	0C8000h
Option 6	3300h	3	0D0000h
Option 7	300h	7	0D8000h
Option 8	2300h	3	0C0000h
Option 9	3300h	7	0C8000h
Option 10	300h	9	0D0000h
Option 11	1300h	12	0D8000h
Option 12	3300h	9	0C0000h
Option 13	300h	12	0C8000h
Option 14	1300h	3	0D0000h
Option 15	2300h	7	0D8000h

** Do not use a configuration option that includes Interrupt level 7.

Figure 2.29
Configuration options
for EtherLink/MC TP 3C523 (Assy. #6852) board

Interrupt Level	Connector Type	Base I/O Address	RAM Buffer Address
3*	BNC	300*	C0000*
9	or	1300	C8000
7	DIX	2300	D0000
12		3300	D8000

* Default Settings

Figure 2.30
Settings for EtherLink/MC TP 3C523 (Assy. #6852) boards in NetWare v3.*x* servers

For NetWare v3.*x* file servers, select configuration options using any combination of the information in Figure 2.30.

Note: For twisted pair cabling, select connector type BNC.

Where to go from here

After you have completed hardware and software installation of your boards, continue with Section 3, "Cabling your network" on page 65.

Notes

Section 3: Cabling the network

This section explains how to cable a thin Ethernet cable network, a thick Ethernet cable network, a thin/thick Ethernet cable network, and a twisted pair Ethernet cable network. Observe the following guidelines as you install your cable network:

- Make sure each network station is turned off.
- Install one trunk segment at a time if you are installing more than one.
- Be careful not to crimp the cable, damage its insulation, or run the cable near heat sources, fluorescent light fixtures, or in heavy traffic areas where hand trucks or rolling chairs might damage it.

Cabling a thin Ethernet cable network

This section explains the procedure for cabling this type of network, and then refers you to the appropriate source of additional information.

Cabling procedure

Use the following procedure to cable your network:

1. **Place the stations and peripherals in their predetermined locations.**

   Refer to the diagram of your network layout.

2. **Create trunk segment cables by connecting cable with T-connectors.**

3. **Connect the T-connectors to the BNC connector jacks on the network boards installed in each station.**

4. **Attach a BNC terminator to each end of the trunk segment.**

   One of these terminators should have a grounding wire attached. Attach the end of the grounding wire to an earth ground (the middle screw of an AC outlet). If the grounding wire is too short to reach the outlet, extend it with 16- or 18-gauge insulated wire.

   Figure 3.1 illustrates a thin Ethernet cable trunk segment.

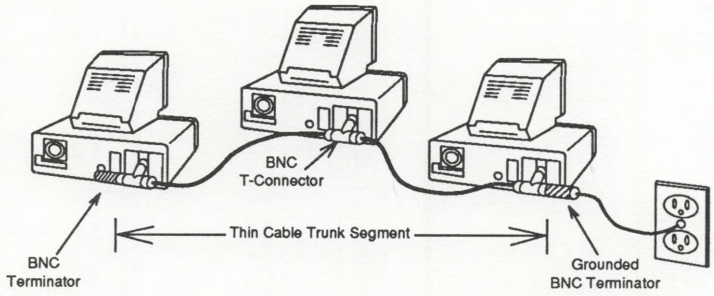


Figure 3.1
Thin cable trunk segment

5. **To connect two trunk segments to a repeater, attach one end of each trunk segment directly to the repeater (as if the repeater were another workstation).**

   Refer to Figure 1.4 on page 6 for an example of a thin Ethernet cable network using a repeater.

Where to go from here

If you have completed cabling your network, return to your main NetWare installation manual that referred you to this supplement.

Cabling a thick Ethernet cable network

This section explains the procedure for cabling this type of network, and then refers you to the appropriate source of additional information.

Cabling procedure

Use the following procedure to cable your network:

1. **Place the stations and peripherals in their predetermined locations.**

   Refer to the diagram of your network layout.

2. **Install the transceivers according the manufacturer's directions and your network plan.**

3. **Connect the transceivers to the thick cable.**

4. **Attach the connector on the transceiver cable to the transceiver.**

   Slide the lock to "open," attach it to the transceiver, and then slide the lock back to "lock" as shown in Figure 3.2. The slide lock prevents accidental disconnection.

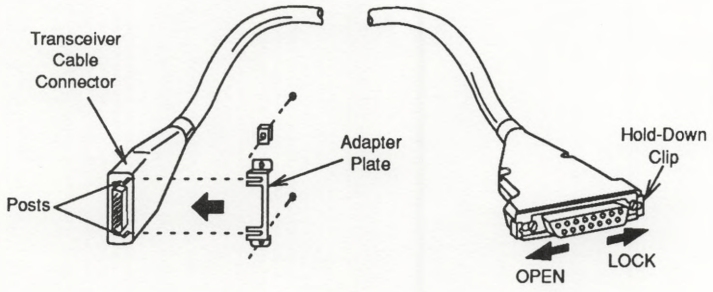


Figure 3.2
Using the slide lock

5. **Attach the DIX connector plug (on the other end of the transceiver cable) to the network board.**

   If the DIX connector plug has no adapter plate, attach one before attaching to the network board.

   Refer to Figure 3.2 and use the following instructions:

   - Slide the two threaded clips onto each end of the adapter plate and insert the screws into the clips.
   - Align the slots in the adapter plate with the posts on the connector and slide the plate sideways onto the connector.

6. **Attach an N-series terminator to each end of the trunk segment.**

   Attach the end of the grounding wire to an earth ground (the middle screw of an AC power outlet). If the grounding wire is too short to reach the outlet, extend it with 16- or 18-gauge insulated wire. Refer to Figure 3.3 below.

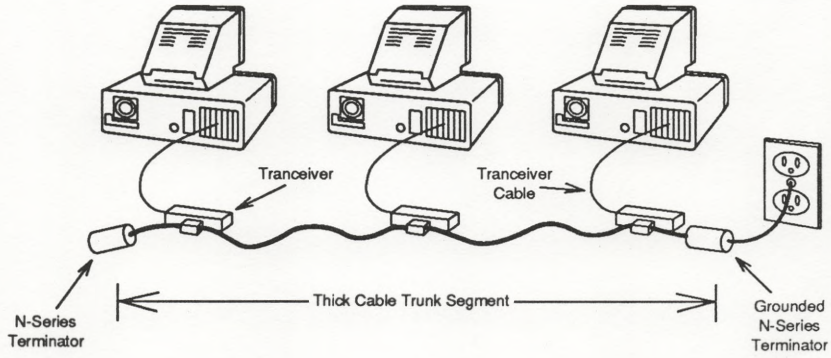


Figure 3.3
Attaching N-series terminators to trunk segments

7. **To join two trunk segments, connect one end of each trunk segment to the same repeater.**

   Trunk segments are connected to repeaters in the same way that they are connected to stations (by means of a transceiver and a transceiver cable).

Where to go from here

If you are using only thick Ethernet cable and have completed cabling your network, return to your main NetWare installation manual.

Cabling a thin/thick cable network

If you plan to use thin and thick cable in the same trunk segment, read the discussion on pages 3 through 7 before cabling your network.

- Be sure to follow the limits and rules described in Section 1 that apply to your network layout.
- Remember to use adapters to connect thin and thick cable.

If you have completed cabling your network, return to your main NetWare installation manual that referred you to this supplement.

Cabling a twisted pair network

This section explains the procedure for cabling this type of network, and then refers you to the appropriate source of additional information.

Cabling procedure

Use the following procedure to cable your network:

1. **Place the stations and peripherals in their predetermined locations.**

   Refer to the diagram of your network layout.

2. **Attach the connector plug (on the either end of the cable) to the network station jack.**

3. **Attach the opposite connector plug the concentrator jack.**

Where to go from here

If you are finished cabling your network, return to your main NetWare manual.

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